FINAL REPORT

Assessment of Geology, Energy, and Minerals (GEM) Resources

BADLANDS GEM RESOURCE AREA

(NV-010-04)

ELKO COUNTY, NEVADA

Prepared for

United States Department of the Interior
United States Bureau of Land Management
Scientific Systems Development Branch

March 1983

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(NV - 010 - 04)
Elko County, Nevada

Prepared For:

United States Department of the Interior
United States Bureau of Land Management
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March 1983

This report was prepared as part of a Phase I Assessment of GEM Resources within designated Wilderness Study Areas in Oregon, Idaho and Nevada.

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- Dr. Antonius Budding - Oil Shale and Tar Sands
- Mr. Raymond Corcoran - Field Verification
- Dr. James Firby - Paleontology
- Mr. Ralph Mason - Coal
- Mr. Richard Miller - Uranium and Thorium
- Mr. Vernon Newton - Oil and Gas
- Mr. Herbert Schlicker - Industrial Minerals and Geologic Hazards
- Dr. Walter Youngquist - Geothermal
- Dr. Paul Weis - Metals and Non - Metals.

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Ms. Pamela Ruhl provided clerical and editorial assistance throughout the project. Ms. Sara Mathews assisted with occurrence information and drafting. Mr. Philip R. Jones and Mr. Michael A. Becker produced all documents relating to the project using TERRADATA's word processing and document production systems.

EXECUTIVE SUMMARY

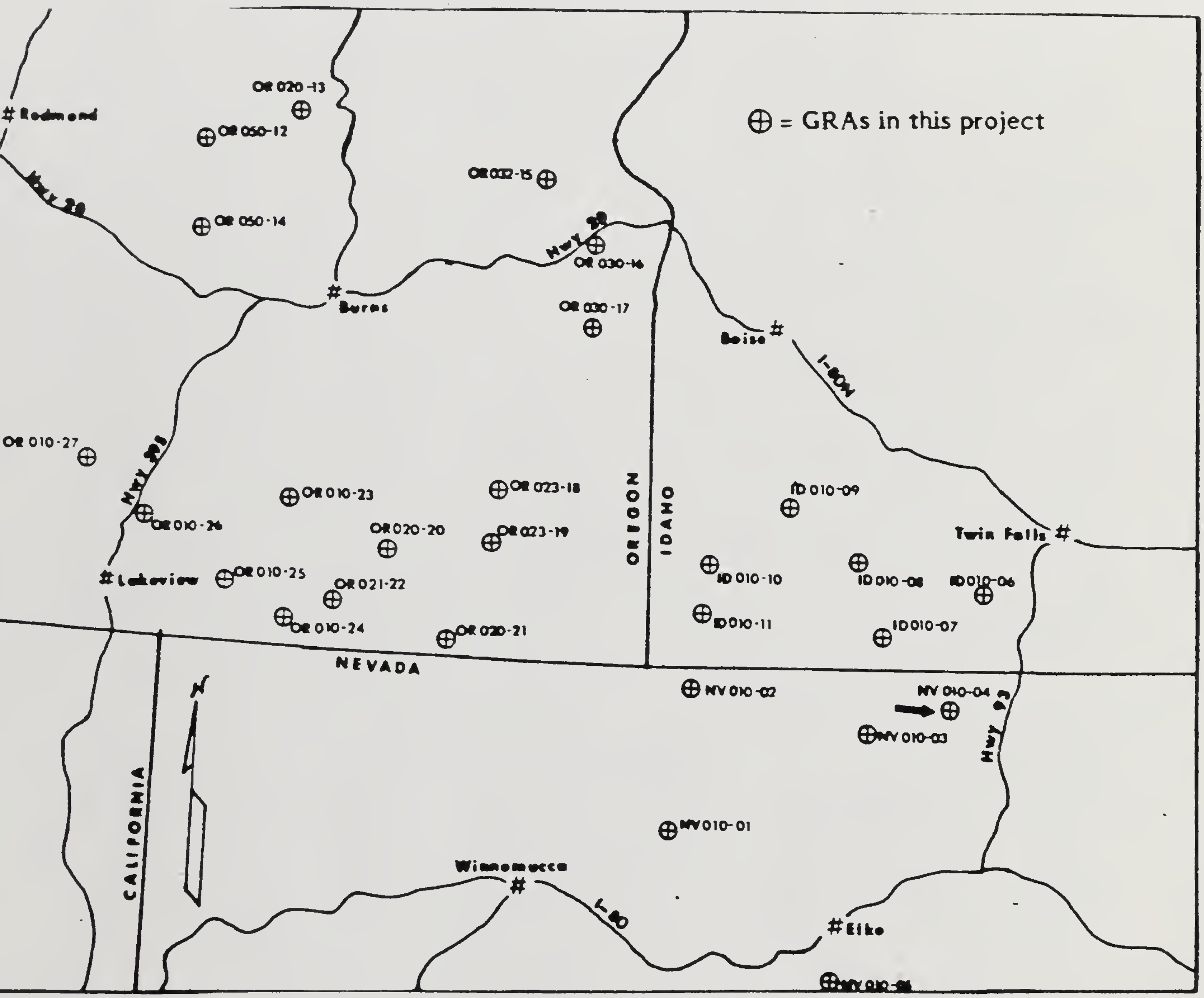
The purpose of this project is to evaluate and classify environments favorable for the occurrence of geology, energy, and minerals (GEM) resources in selected wilderness study areas (WSAs) in southeastern Oregon, southwestern Idaho, and northern Nevada. **(See TERRADATA report entitled "Procedures for the Assessment of Geology, Energy, and Minerals (GEM) Resources.")** GEM resource environments have been rated on a scale that ranges from one to four, with one being least favorable and four being most favorable. Favorability classes two and three represent low and moderate favorability, respectively. Confidence levels range from A to D with A being low confidence and D being high confidence. The confidence levels are directly related to the quantity and quality of the information available for the determination of the favorability classes.

The specific area with which this report deals is the Badlands GEM resource area (GRA number NV-010-04) which is located in northeastern Nevada (see attached location map). The GRA contains about 144 square miles within Townships 44N and 45N and Ranges 62E and 63E. It contains one WSA; WSA 010-184, which has an area of 9,100 acres. The GRA is about 45 miles from Wells, Nevada.

The GRA is within the Basin and Range physiographic province. It contains rocks that range from Paleozoic miogeoclinal sediments to Tertiary volcanics and volcaniclastic sedimentary rocks and Quaternary sediments. The area is east of the major structural Antler orogenic belt, and near the Contact Mining District. Basin and Range fault blocks are common in this portion of Nevada. The geologic environments and inferred geologic processes in the Badlands GRA indicates a high favorability (Class 4) for the occurrence of limestone and phosphate GEM resources; a moderate favorability (Class 3) for metals, oil and gas, barite, and paleontological GEM resources; and low to no favorability for all other GEM resources (see attached Table).

Favorability for limestone and phosphate is high in this GRA because Carboniferous limestones and the Permian Phosphoria Formation are known to be present. Oil and gas favorability is based on the presence of favorable lithologies and information from nearby drillholes.

GRA Location Map



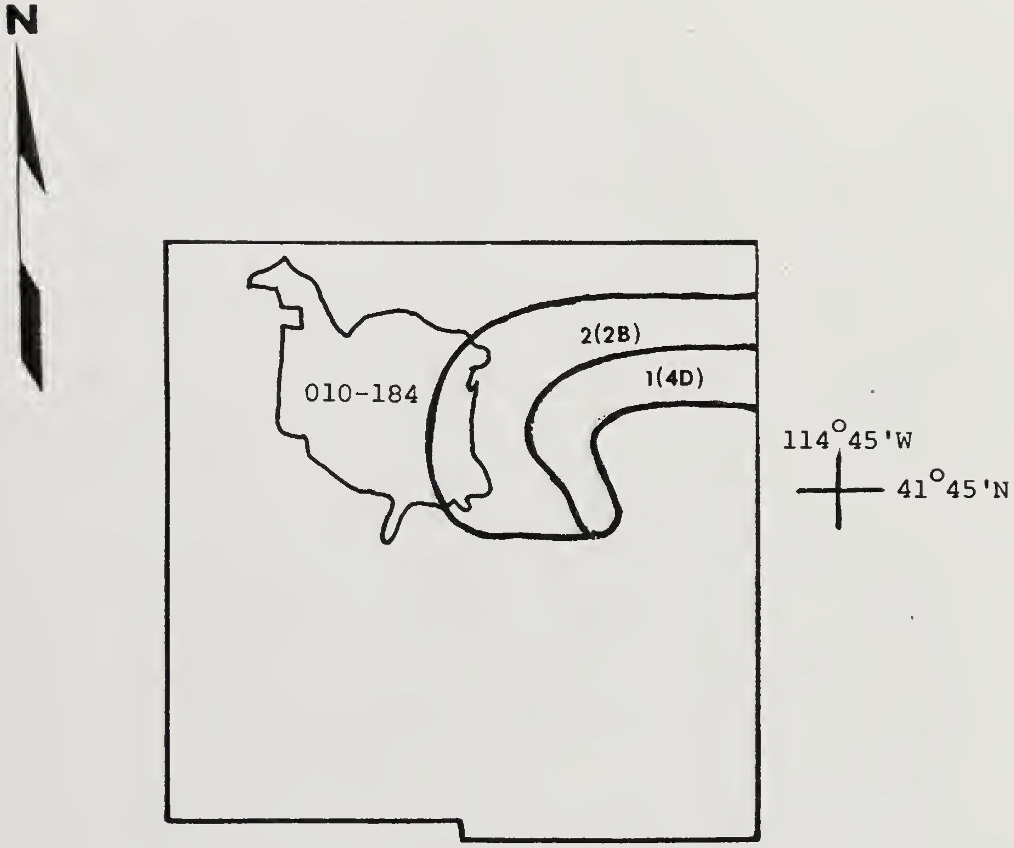
Metals favorability (Classes 4 and 2) is primarily based on the proximity of the WSA to the Contact Mining District. This classification in Area 1-4D has a high confidence level because of the known deposits, and a seemingly low confidence level in Area 2-2B because the lack of sub-surface information does not permit the extrapolation of the environment of the Contact District into the WSA.

Subdivision of the Badlands GRA into more definitive areas is not possible because of the low resolution and low precision of the available data (see attached Map).

Further surface geologic investigations, including detailed mapping and stratigraphic studies, would enhance the confidence levels of many of the classifications in the Badlands GRA. It is doubtful, however, that the original classifications would change substantially. Geophysical and geochemical surveys might provide some insight into the potential resources in the study area.

Detailed gravity studies within the WSA could help delineate the limits of the adjacent Contact stock. These studies would have the potential of altering the classification of the area for metallic GEM resources.

Land Classification Map
Badlands GRA
(NV - 010 - 04)
Elko County Nevada



Scale 1:250,000
(Wells 1^{o}x2^{o} NTMS Quadrangle)

Classification Of Lands Within The
Badlands GRA
(NV - 010 - 04)
Elko County, Nevada
For GEM Resource Potential

COMMODITY	AREA	CLASSIFICATION LEVEL	CONFIDENCE LEVEL	REMARKS
Metals	Area 1-4D	4	D	Cu, Mo, W,
	Area 2-2B	2	B	Au, Ag, Pb
	Rest of GRA	1	B	
Geothermal	Entire GRA	1	D	
Uranium/Thorium	Entire GRA	1	A	
Coal	Entire GRA	1	C	
Oil and Gas	Entire GRA	3	C	
Tar Sands/Oil Shale	Entire GRA	1	C	
Limestone	Entire GRA	4	D	
Bentonite	Entire GRA	2	A	
Diatomite	Entire GRA	1	B	
Clinoptilolite	Entire GRA	1	A	
Barite	Entire GRA	3	A	
Turquoise	Entire GRA	2	A	
Perlite	Entire GRA	1	A	
Phosphate	Entire GRA	4	D	
Paleontology	Entire GRA	3	B	
Hazards	See Hazards Map (GRA File)			
ESLs	None	1	C	

LEGEND:
Class 1 - Least Favorable
Class 2 - Low Favorability
Class 3 - Moderate Favorability
Class 4 - High Favorability

Confidence Level A - Insufficient data or no direct evidence
Confidence Level B - Indirect evidence available
Confidence Level C - Direct evidence but quantitatively minimal
Confidence Level D - Abundant direct and indirect evidence

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1. INTRODUCTION

This report is one of 27 GRA technical reports that summarize the results of a Phase 1 assessment of the geology, energy, and minerals (GEM) resources in selected portions of southeastern Oregon, southwestern Idaho, and northern Nevada. The study region was subdivided into 27 GEM resource areas (GRAs), principally for ease of data management and interpretation. The assessment of GEM resources for this project consisted of an interpretation of existing literature and information by experts knowledgeable in both the geographic area and specific commodities. It is possible that the assessment would be different if detailed field exploration, geochemical sampling, and exploratory drilling programs were undertaken. (See the TERRADATA report entitled "Procedures for the Assessment of Geology, Energy, and Minerals (GEM) Resources.")

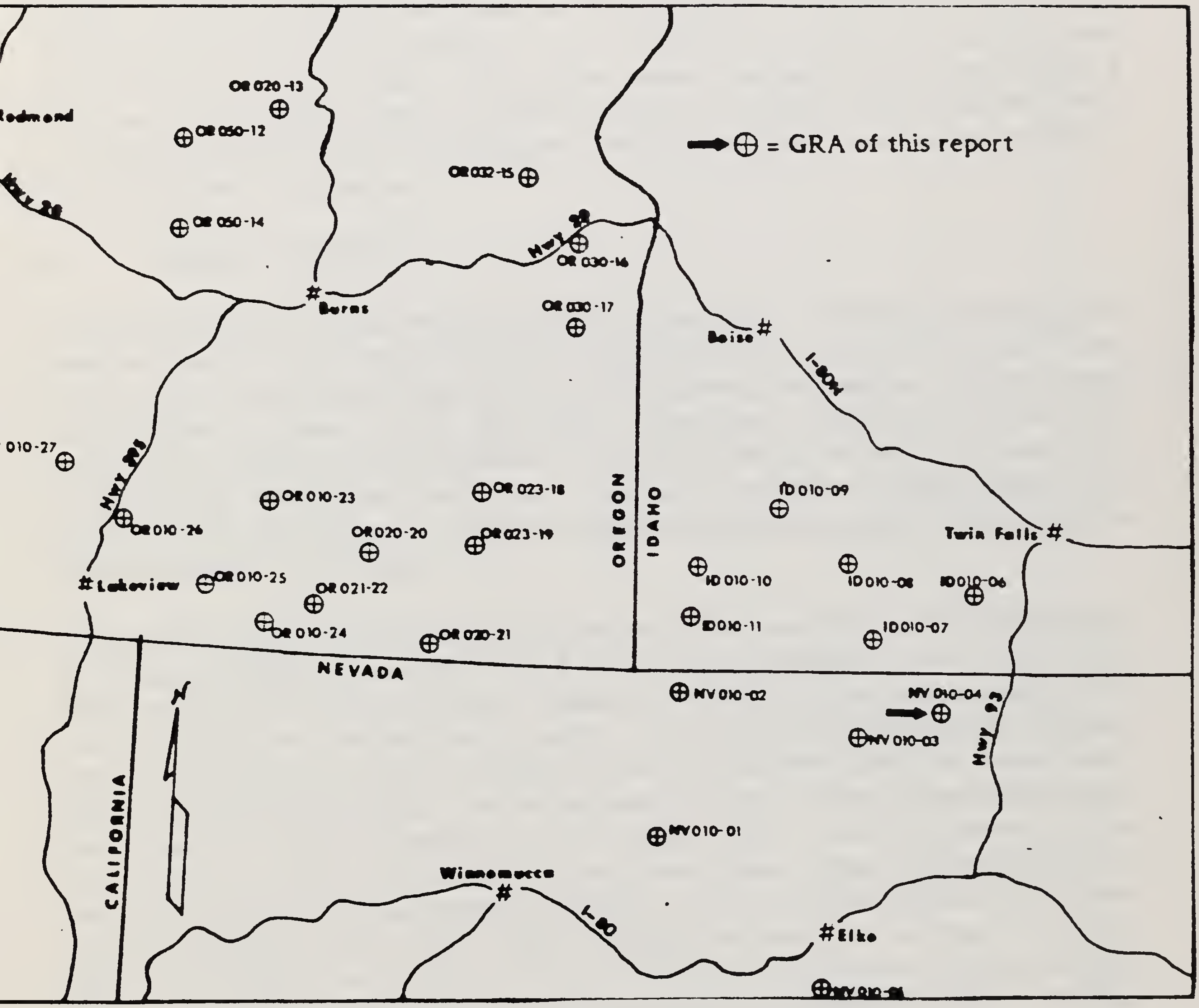
This report summarizes the assessment of the GEM resources potential of the Badlands GRA (NV-010-04). See Figure 1-1. Commodity categories for which this GRA was evaluated are:

- Metals
- Oil and Gas
- Oil Shale and Tar Sands
- Geothermal
- Uranium and Thorium
- Coal
- Industrial Minerals
- Paleontological Resources
- Geologic Hazards
- Educational and Scientific Localities (ESLs)

Geologic environments within the Badlands GRA have been rated with respect to their favorability for the occurrence of these different commodities. The favorability rating scale ranges from one to four, with one being least favorable and four being most favorable. Confidence levels in these ratings also have been assigned. These confidence levels range from A to D, with A being low confidence and D high confidence. Assigned confidence levels are related to the quantity and quality of the information available for the determination of the favorability ratings.

FIGURE 1-1

GRA Location Map



2. DESCRIPTION OF THE BADLANDS GRA

2.1 LOCATION

The Badlands GRA (NV-010-04) is in northeast Nevada. It lies between latitudes 41°40'N and 41°50'N and longitudes 114°46'W and 115°01'W. The GRA contains approximately 144 square miles within Townships 62E and 63E and Ranges 44N and 45N (see Figures 1-1 and 2-1). The area contains one Wilderness Study Area; WSA 010-184 (9,100 acres). The Badlands GRA is in the Wells Resource Area of the Elko BLM District. The area is about 45 miles from Wells, Nevada, which is the nearest transportation center offering a minimum of rail, highway, and/or charter-air services. Access to the contained WSA is via county maintained dirt or packed-gravel roads. Vehicular access to the interior of the WSA is poor to non-existent.

2.2 GENERAL GEOLOGY

The Badlands GRA is in the Wells 1°x2° NTMS Quadrangle. The data available for this area includes NURE investigations[1,2,3]*, general mineral resource information[4], and limited small scale geologic mapping[5]. Detailed geologic information is scarce in most areas outside of known mining districts[5]. Occurrence information for this GRA includes MILS, CRIB, claims, and leases. The overall quantity and quality of information is fair for the commodities that occur in the associated known mining district. The available information is poor to fair for all other commodities; most of the commodities do not occur in or near the area.

The Badlands GRA is within the northern section of the Great Basin portion of the Basin and Range physiographic province. The Basin and Range Province consists of generally north-trending fault-block mountains separated by parallel intermontane basins. The mountain blocks are commonly ten to twelve miles wide and are separated by alluviated valleys of comparable width. In northern Nevada and southern Idaho this characteristic Basin and Range physiography is not as pronounced. The mountain ranges become sub-parallel and the basins are smaller and not as well defined. Local relief generally is less than 5,000 feet. The physiography of the Great Basin reflects the structural and lithologic complexity of the underlying bedrock. The Great Basin portion of the Basin and Range Province extends from southern Nevada, northward into southern Oregon and Idaho. The northern-most extremity is located just north of the town of Burns, Oregon. Rocks in the area range from Paleozoic eugeoclinal-miogeoclinal suites to Tertiary volcanogenic and lacustrine strata (see Figure 2-2).

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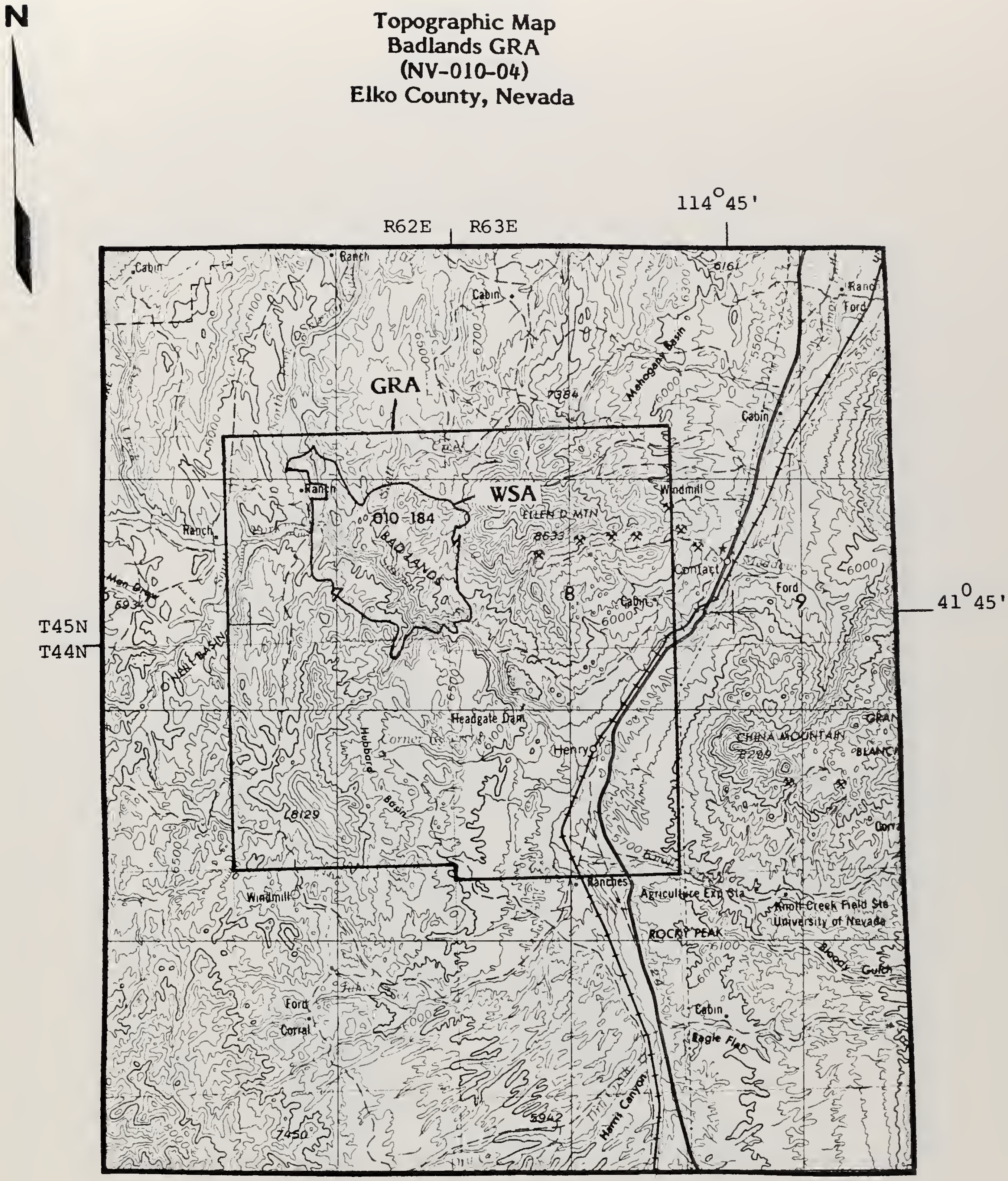
* In this report, citations are superscripted numbers. They refer to bibliographic entries listed in Appendix A: References Cited.

FIGURE 2-1

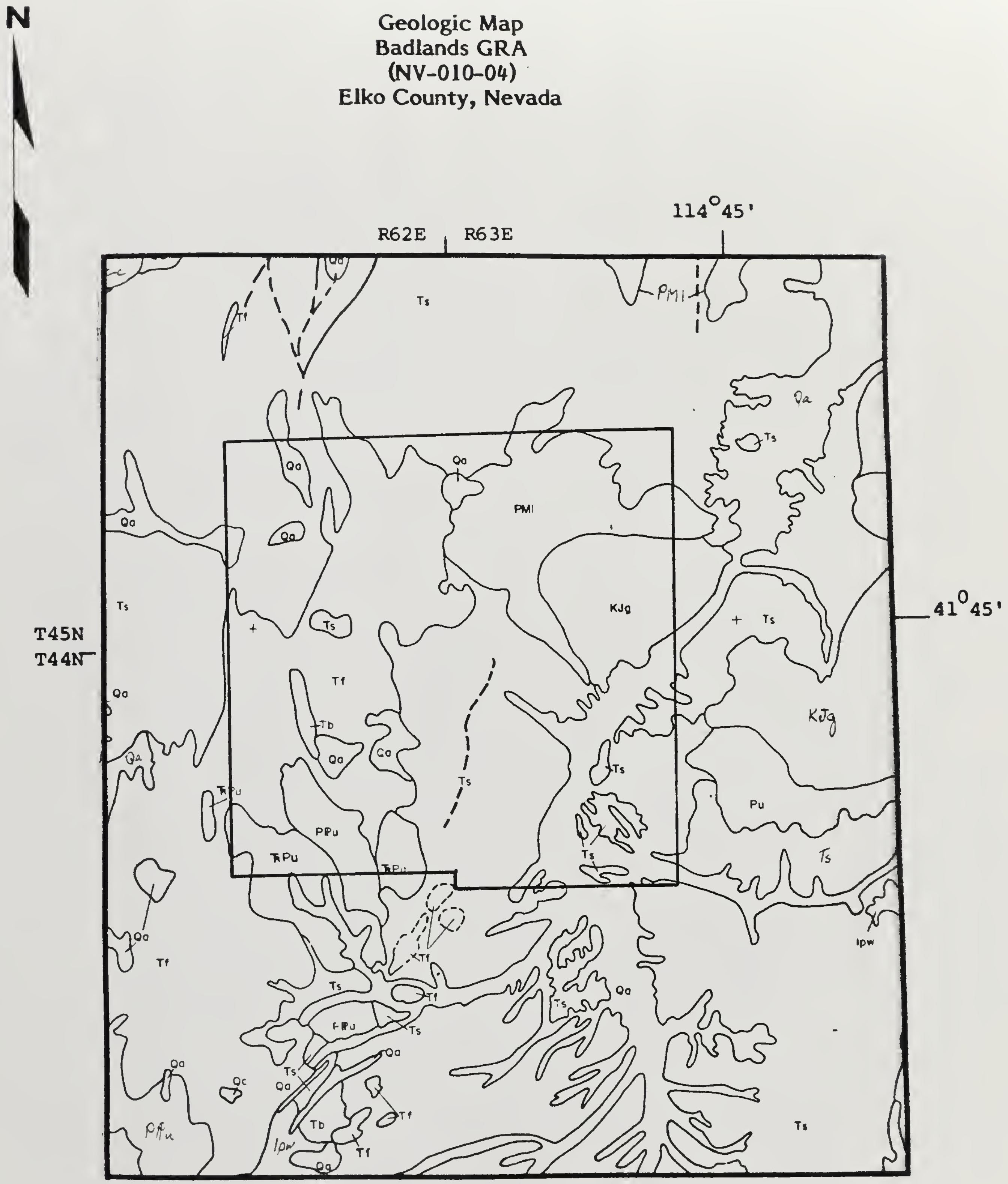
Topographic Map
Badlands GRA
(NV-010-04)
Elko County, Nevada



Scale 1:250,000
(Wells $1^{o}x2^{o}$ NTMS Quadrangle)

FIGURE 2-2

Geologic Map
Badlands GRA
(NV-010-04)
Elko County, Nevada



Scale 1:250,000
(Wells 1°x2° NTMS Quadrangle)

FIGURE 2-2
(Continued)

Geologic Map Legend For
Badlands GRA
(NV-010-04)
Elko County, Nevada

Qc	-	Colluvium and Landslide Deposits.
Qa	-	Alluvium: Silt, sand and gravel along streams, including terrace deposits.
Ts	-	Tertiary Sedimentary Rocks: Dominantly tuff, ignimbrite, conglomerate, gravel, sandstone, shale and limestone.
tf	-	Felsic Volcanic Extrusives: Dominantly rhyolites to dacites; flow and domes.
Tb	-	Mafic Volcanic Extrusives: Dominantly andesites to basalts.
KJg	-	Granite and Related Rocks: Granite, diorite, grandiorite and quartz monzonite.
ŦPu	-	Triassic-Permian Clastic Sedimentary Rocks, Undifferentiated: Minor greenstone, and silty limestone. Includes Edna Mountain, Moenkopi, and Thaynes Formations.
Pu	-	Upper Permian Sedimentary Rocks, Undifferentiated: Dominantly carbonates and phosphatic rocks. Some chert and limestone. Includes Phosphoria, Gerster, and Pequop Formations, and Park City Group.
PPu	-	Permian-Pennsylvanian Carbonates: Limestone and dolomite. Includes Buckskin Mountain, Beacon Flat, Carlin Canyon, Strathearn, Sunflower, Winecup, and Gerguson Mountain Formations.
PML	-	Permian-Mississippian Limestone: Includes Tripon Pass and Van Duzer Limestones, and Banner and Nelson Formations.
Lpw	-	Lower Paleozoic Western Facies: Dominantly fine-grained clastic sediments with some limestones and dolomites.
Єc	-	Carbonate Rocks, Minor Quartzite, and Phyllite: Includes Edgemont Formation and Porter Peak Limestone.
	-	Fault (dashed where inferred).
	-	Geologic contact (dashed where inferred).

2.2.1 Geomorphology

The dominant geomorphological feature in the Badlands GRA is Ellen D (also know as L&D) Mountain. This peak reaches an elevation of 8,633 feet and is the highest point in the study area. Unlike other portions of the Basin and Range Province, this area does not exhibit characteristic north-trending, parallel ranges and intervening basins. The Granite Range, east of the Badlands GRA, trends northeasterly; the Snake Mountains, to the south, trend northwesterly. Ellen D Mountain is separated from both ranges by small, but deep (5,000 feet) basins(6).

WSA 010-184 is the only WSA in this GRA. It is located in the northwest corner of the area, just west of the summit of Ellen D Mountain. Ellen D Mountain exhibits a radial drainage pattern with first order streams that head primarily at springs. Salmon Falls Creek flows from northwest to southeast through the WSA. This creek is underfit and flows in a deeply incised (400 to 500 feet) flat-bottomed canyon. All tributaries to Salmon Falls Creek that originate within the WSA are intermittent.

East of the WSA there is a marked change in slope near the foot of Ellen D Mountain. This change in slope, paired with a ridge that trends southeasterly from the southern edge of Ellen D Mountain, indicates the contact between a Cretaceous intrusive stock and Paleozoic units that underlie Ellen D Mountain.

The southeast portion of the GRA is a relatively flat, low-lying basin. Total relief in the GRA is 3,233 feet. The lowest point in the GRA is 5,400 feet along Salmon Falls Creek, just north of the village of Contact, Nevada.

2.2.2 Lithology and Stratigraphy

Rocks within or near the Badlands GRA range in age from Paleozoic limestones and dolomites to Late Miocene or younger lacustrine, fluvial, and volcaniclastic strata. Late Paleozoic units in this area are part of the eastern miogeoclinal assemblage(4). Whereas Paleozoic sequences may have an aggregate thickness up to 28,000 feet in northeastern Nevada, Mesozoic strata are only a few thousand feet thick. Cenozoic valley fill sediments may be up to 10,000 feet thick.

The oldest exposed rock units within the GRA are Permian-Mississippian limestones. These units underlie Ellen D Mountain and comprise about ten percent of the area within the GRA (Figure 2-2). These units undoubtedly occur under the Tertiary volcanic cover in the basins north and south of Ellen D Mountain. The depth to Paleozoic rocks in the basins is unknown; it is probably several thousand feet.

Paleozoic units in the southwestern part of the Badlands GRA include Permo-Pennsylvanian limestones and dolomites, and undifferentiated Permian to Triassic clastic sedimentary units that contain minor greenstone and silty limestone. Map unit TrPu includes the Edna Mountain, Moenkopi, and Thaynes Formations. Paleozoic and Mesozoic rocks also occur in the northeastern quarter of the GRA. Mississippian to Permian carbonates underlie several square miles due west of Contact, Nevada. Jurassic and Cretaceous intrusive rocks are exposed just west and southwest of Contact.

Tertiary units within the GRA may be subdivided into three broad categories, as shown on the geologic map (Figure 2-2). Most dominant are felsic volcanic extrusives. These are dominantly calc-alkalic and metaluminous and range in composition from rhyolite to dacite. They consist of flows and domes and underlie an estimated 85 percent of the WSA.

Ferromagnesian-rich volcanic extrusives cover less than one percent of the GRA, and do not occur within the WSA. The remainder of the area is immediately underlain by Tertiary sedimentary rocks, and/or Quaternary alluvial and colluvial deposits. The majority of the Tertiary sediments in the Badlands GRA compose the Late Miocene or Pliocene lacustrine, fluvial, and volcaniclastic strata of the Humboldt Formation[7]. Valley fill comprises Quaternary alluvial and fanglomeratic sediments.

2.2.3 Structural Geology

The tri-state area of northeastern Nevada, southern Oregon, and southwestern Idaho is characterized by several major structural elements. During the Early Paleozoic this tri-state area was the site of marine sedimentation in the north-northeast trending Cordilleran geosyncline. Sedimentation persisted in three sub-parallel belts until the end of the Devonian Period. One sedimentation belt was located in the eastern half of Nevada and received nearshore to littoral deposits of shallow-water carbonates with a minor amount of interbedded shale and sandstone. The second sedimentation belt was in

the western half of the state and was the locus of transitional, progressively deeper water deposits. The third belt, located further west, was the site of eugeoclinal deposits.

In Late Devonian time, the Antler Orogeny developed along a north-northeast trending swath through northwest Elko County, Nevada, and on into southwestern Idaho[8]. The Badlands GRA is east of the axis of the Antler orogenic belt. The orogeny culminated in a period of extensive thrust faulting that includes the Roberts' Mountain thrust.

The Sonoma Orogeny occurred in the Permian in north-central Nevada[9]. This deformational episode included more thrust faulting west of the Badlands GRA.

2.2.4 Paleontology

Paleontological assemblages within the Badlands GRA range from Early Paleozoic marine fauna to fossils representing Tertiary non-marine facies. Adjacent and subjacent plutonic activity may have modified Plaeozoic marine strata, destroying fossil evidence. Where Late Paleozoic strata have not been recrystallized, fossil assemblages characteristic of miogeoclinal and shelf facies may be found. Although the Humboldt Formation is elsewhere known to contain fossil mammals, mollusks, fish, and flora, no such fossils have been reported from the Humboldt Formation in this area.

2.2.5 Historical Geology

The present geologic character of the Great Basin resulted from the progressive development of the western portion of the North American continent throughout geologic time. Beginning in the Late Precambrian and continuing into the Middle Paleozoic, eastern Nevada, western Utah, and southwesternmost Idaho were characterized by a miogeoclinal environment in which shelf margin carbonates, shales, and sandstones were deposited. In contrast, western Nevada and southern Oregon were in a eugeoclinal environment in which dark shales, radiolarian cherts and basaltic materials (Steinman's Trinity) were formed.

The Middle Paleozoic (Late Devonian-Early Mississippian) Antler Orogeny deformed and thrust the eugeoclinal sediments over the shelf-type sediments to the east, resulting in a north-trending highland in central Nevada. A vast amount of fine-grained detritus was shed eastward during the Mississippian, producing thick upper Paleozoic shales in eastern

Nevada and western Utah. Erosion of the Antler Highlands resulted in the deposition of coarse sediments during the Early Pennsylvanian. Thousands of feet of sandstone and conglomerate were deposited in northern Nevada around the margins of the Antler Highlands. Late Pennsylvanian and Permian shallow water sediments overlapped and overstepped the roots of the eroded highlands. Many of the carbonates exposed in the Badlands GRA formed during this episode. Sediments deposited over the Antler Highlands in the Permian were predominantly of the deep water variety. The next significant tectonic episode (the Sonoma Orogeny) thrust the ocean floor siliceous and volcanic materials eastward over the shallow water, clastic sedimentary rocks that covered the ancient Antler Highlands.

Development of western North America in the Mesozoic was dominated by oceanic plate subduction along the continental margin that resulted in a complex history of concomittant sedimentation, deformation, and igneous activity. During this time, the well-defined overthrust belt that extends from Canada to Mexico was formed. This deformation occurred during the Sevier (Late Jurassic to Late Cretaceous) and Laramide orogenies (Latest Cretaceous to Early Tertiary). Numerous granitic and grandioritic plutons were emplaced during the Mesozoic. These Jurassic and Cretaceous bodies are important in that they often are associated with mineralization.

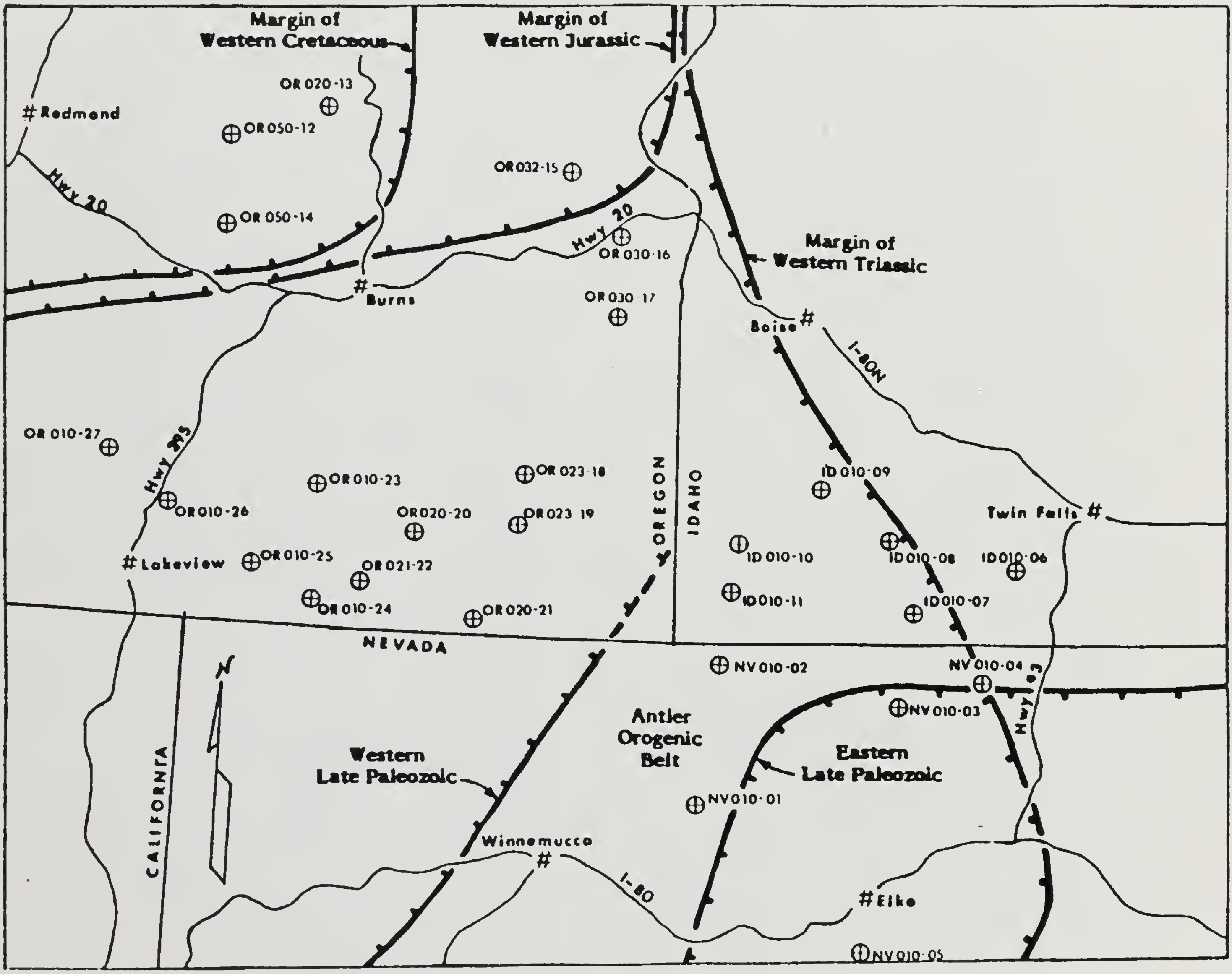
Widespread silicic volcanic rocks formed in the Great Basin in Early and Middle Cenozoic time (primarily 20-34 million years ago). During Late Cenozoic time volcanic activity of the Great Basin changed to a bimodal basalt-rhyolite assemblage that reflects the taphrogenic character of the region. It was also during this time that the tectonic character of the region changed from one of compression to one of extension and led to the development of the Basin and Range structures.

2.3 ENVIRONMENTS FAVORABLE FOR GEM RESOURCES

The Badlands GRA contains environments that are favorable for eight GEM resources. These resources are metals, oil and gas, limestone, phosphate, barite turquoise, perlite, and paleontological resources.

FIGURE 2-3

Paleogeographic Map(9)
Oregon-Idaho-Nevada
Tri-State Area



2.3.1 Environments for Metals Resources

The Badlands GRA encompasses the Contact Mining District. The Contact District is located less than two miles east of WSA 010-184. Historically, this district has produced minor amounts of copper, and lesser amounts of tungsten, molybdemun, gold, silver, and lead (Figures 3-1, 3-2, 3-3). Mineralization in the district occurs along the contacts between Mesozoic granites or alaskitic intrusives and Carboniferous limestones, shales, and quartzites. Most of the deposits are in skarn zones in Mississippian to Permian limestones and marbles.

The most important recognition criteria for these deposits are the existence of the requisite contact and the relationship of the intrusives and carbonate hosts. The contact between these units dips to the west in the western part of the district. WSA 010-184 is just west of the Contact District and is nearly completely underlain by unmineralized felsic volcanic rocks of unknown thickness. There is a possibility, however, that the environment favorable for mineralization in the Contact District may exist at depth beneath the study area. The Contact District is bounded on the north and south by gravity lows that indicate deep sedimentary basins(2). The geometry of the contact zone and the intrusive units is not known west of the district, nor is an excessively deep basin postulated in this area. Nevertheless, if the contact maintains the dip that is apparent in the western edge of the district, potential mineralization beneath the WSA would be at a depth of several thousand feet(10).

2.3.2 Environments for Oil and Gas Resources

Favorable criteria that are met in this study area include the existence of potential petroleum hosts, and proximity of the area to known occurrences in exploratory drill holes, and the existence of leasing activity within the GRA. Because the Badlands GRA is located east of the Devonian Antler Uplift, favorable shelf facies within the eastern Late Paleozoic marine assemblage may occur at depth beneath the GRA.

Two exploratory holes drilled by Gulf Refining Company (Mary's River No. 1, and Thousand Springs No. 1) south of the GRA encountered oil and gas shows(9). About 30 percent of the GRA is currently leased or under lease application.

2.3.3 Environments for Oil Shale and Tar Sands Resources

The Badlands GRA contains no environments favorable for the occurrence of oil shale or oil impregnated sand[11]. The area is underlain predominantly by Tertiary volcanics of felsic composition. Potential sedimentary hosts are largely tuffaceous and contain only minor amounts of non-volcanic clastic material and carbonates. Favorable lithologies are not present.

2.3.4 Environments for Geothermal Resources

There are no environments favorable for the occurrence of geothermal resources in the Badlands GRA[12]. The lack of young volcanics, major fault zones, and any geothermal occurrences support this conclusion. Cretaceous granites and Paleozoic marine rocks do not provide favorable environments for geothermal resources[12].

2.3.5 Environments for Uranium and Thorium Resources

The Badlands GRA contains no environments favorable for the occurrence of uranium or thorium[13]. The GRA does not exhibit the necessary lithology, alteration, or geochemical recognition criteria that suggest the presence of environments that may be favorable for uranium or thorium. There are no uranium occurrences in or near the area. Although hydrothermal mineralization occurs in the area, there is no evidence that indicates the presence of associated uranium or thorium.

2.3.6 Environments for Coal Resources

The Badlands GRA contains low favorability for the occurrence of coal and lignite deposits[14]. The chances for coal or carbonaceous materials to have formed in the study area are remote. The geology of the Badlands GRA region does not support environments favorable for the formation of coal deposits. Much of the area is underlain by marine carbonates or is mantled with accumulations of lavas and related volcanic products or has been modified by adjacent and subjacent igneous activity.

2.3.7 Environments for Industrial Minerals Resources

Two environments that are highly favorable for limestone and phosphate resources exist

within or adjacent to the Badlands GRA. Although limestone is not actively mined in the study area, it occurs in Cambrian through Triassic marine units within the GRA. The Late Permian Phosphoria Formation, a major source of phosphate products in southeastern Idaho, is mapped just east of the GRA (Figure 2-2). The Phosphoria Formation undoubtedly occurs in undifferentiated Permian units within the GRA.

Barite also occurs in Permian rocks two miles east of the GRA[15]. It may occur as fissure veins or replacement bodies where reactive limestones or dolomites are present. These potential environments are present within the GRA.

Cretaceous and Tertiary felsic volcanic units within the GRA provide potential environments for the formation of bentonite deposits as alteration products.

Environments for the formation of turquoise (a hydrous copper aluminum phosphate formed by epigenetic processes) are known to occur 25 miles southwest of the GRA[15]. The basic components for the formation of turquoise are present within the GRA. There is no direct evidence, however, that the process has actually taken place within the study area.

2.3.8 Environments for Paleontological Resources

Paleontological assemblages that may occur within or near the Badlands GRA range from those representing Early Paleozoic marine facies to those representing Tertiary non-marine facies[16]. Mississippian, Pennsylvanian, and Permian miogeoclinal formations have the highest potential where they have not been altered by subsequent igneous activity. Strata in the Humboldt Formation are known to contain Tertiary fauna and flora fossils in areas outside the GRA. The Humboldt Formation within the GRA probably contains paleontological resources, although no fossil localities are known.

2.3.9 Environments for Geologic Hazards

Potential geologic hazards in the Badlands GRA consist of faults, landslides, and volcanic centers[15]. These features were noted from aerial photographs, geologic maps, and topographic maps. There is no historical record of violent seismic or volcanic acitvity in the area. The potential for mass movement exists along all of the oversteepened slopes within the GRA.

2.3.10 Educational and Scientific Localities

There are no known ESLs in the Badlands GRA.

3. ENERGY AND MINERAL RESOURCES IN THE BADLANDS GRA

WSA 010-184 of the Badlands GRA has potential for containing GEM resources. Apart from potential metalliferous environments, specific areas of favorability have not been delineated within the GRA.

3.1 KNOWN DEPOSITS

Copper deposits that contain minor amounts of other metals occur within the Badlands GRA. The deposits occur primarily as replacement bodies in skarn along or near the east-trending contact between a Mesozoic granitic stock and Mississippian to Permian carbonate rocks in the Contact Mining District.

3.2 OCCURRENCES

The Badlands GRA contains five CRIB localities (Figure 3-1), 25 MILS localities (Figure 3-2) and no NURE-related occurrences. The CRIB and MILS localities are associated primarily with the Contact Mining District, located just to the west of the village of Contact, Nevada. The locality records indicate the presence of copper, tungsten, gold, silver, molybdenum, and lead. The amount of past production is unknown. There are no CRIB or MILS occurrences with WSA 010-184.

3.3 CLAIMS

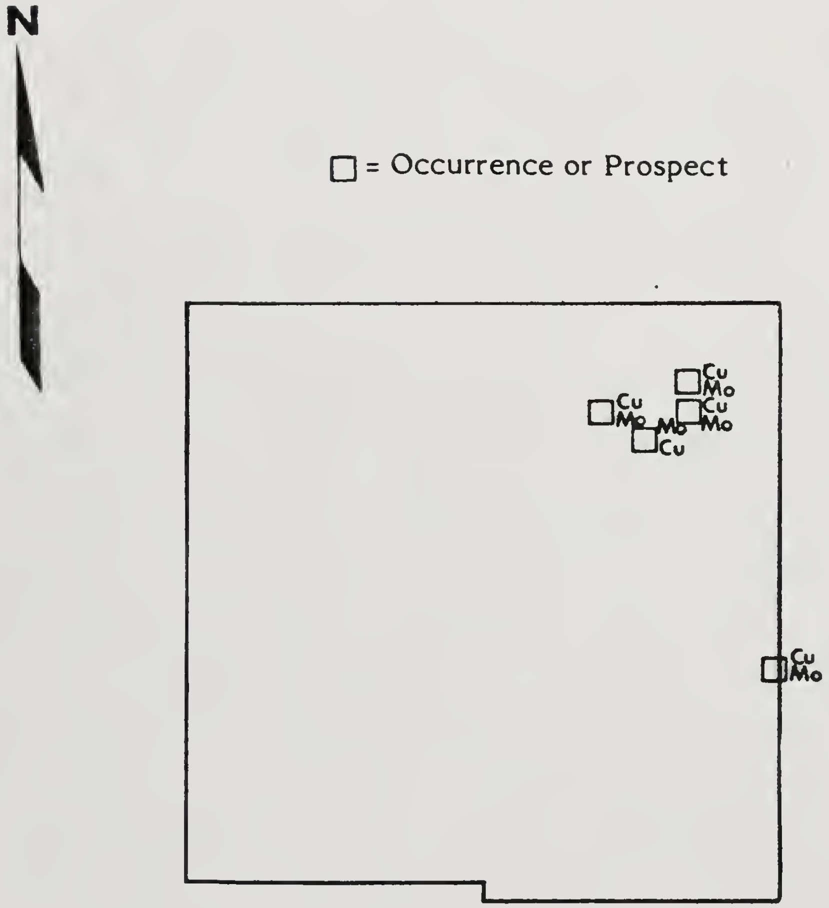
The Badlands GRA contains 105 claims (Figure 3-3). All of the claims are associated with the Contact Mining District in the eastern portion of the GRA. There are no claims in WSA 010-184. Claims information is current as of 15 August, 1982.

3.4 LEASES

The northern portion of the Badlands GRA is currently leased or subject to oil and gas lease applications. This includes all of WSA 010-184. The remainder of the GRA is not leased. Lease information is current as of 15 August, 1982.

FIGURE 3-1

CRIB Localities Map
Badlands GRA
(NV 010-04)
Elko County, Nevada



Scale 1:250,000
(Wells $1^{o}x2^{o}$ NTMS Quadrangle)

This map is an overlay for Figures 2-1 and 2-2.

FIGURE 3-1

Legend For
CRIB Localities Map
Badlands GRA
(NV 010-04)
Elko County, Nevada

1. CRIB No.: M030046
   Location Name: Theodore, Mammoth
   Latitude: 41°-47' N
   Longitude: 114°-50°W
   Commodities: Cu, Mo
   Production: Yes
   Production Size: Unknown
   References: Schrader; 1912; Contact Mining District; USGS Bull. 497.
   Schilling; 1962; Molybdenum in Nevada; NVBM Report 2.

2. CRIB No.: M030052
   Location Name: Theodore, Bonanza
   Latitude: 41°-47'-30" N
   Longitude: 114°-51'-00" W
   Commodities; Cu, Mo
   Production: Yes
   Production Size: Unknown
   References: Schrader; 1912; Contact Mining District; USGS Bull. 497.

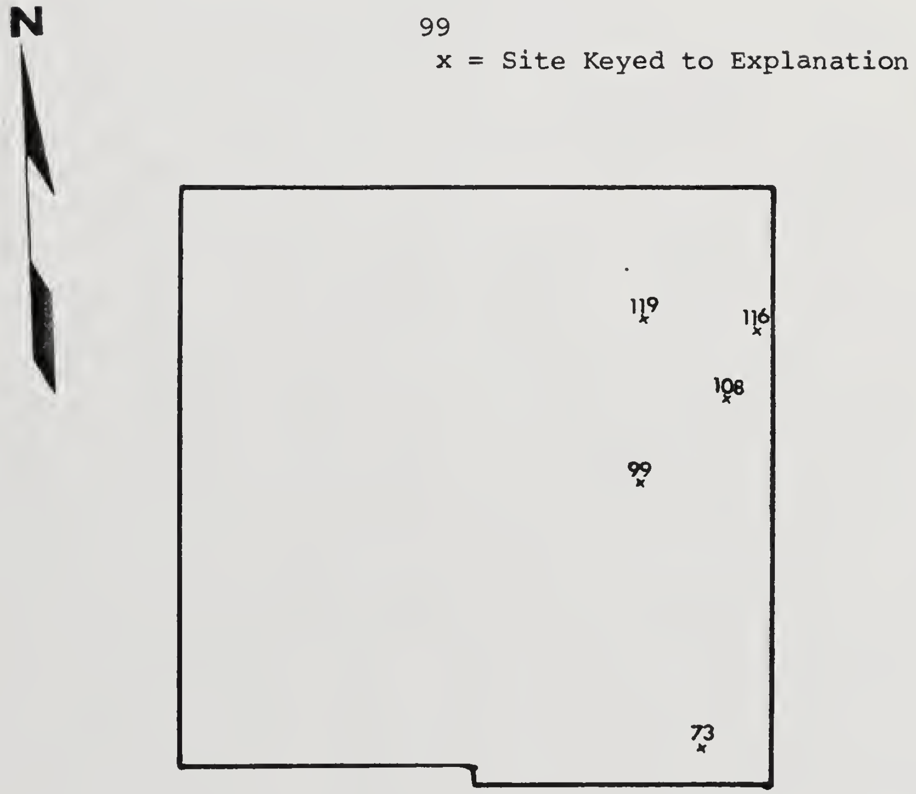
3. CRIB No.: M030053
   Location Name: Theodore, Florence #16
   Latitude: 41°-48'-00" N
   Longitude: 114°-49'-00" W
   Commodities: Cu, Mo
   Production: Yes
   Production Size: Unknown
   References: Schrader; 1912; Contact Mining District; USGS Bull. 497.

4. CRIB No.: M030054
   Location Name: Theodore, Copper Shield
   Latitude: 41°-47'-30" N
   Longitude: 114°-49'-00" W
   Commodities: Cu, Mo
   Production: Yes
   Production Size: Unknown
   References: Schrader; 1912; Contact Mining District; USGS Bull. 497.

5. CRIB No.: M030056
   Location Name: Theodore, Ivy Wilson
   Latitude: 41°-43'-50" N
   Longitude: 114°-47'-00" W
   Commodities: Cu, Mo
   Production: No
   Production Size: Unknown
   References: Schrader; 1912; Contact Mining District; USGS Bull. 497

FIGURE 3-2

MILS Localities Map
Badlands GRA
(NV 010-04)
Elko County, Nevada



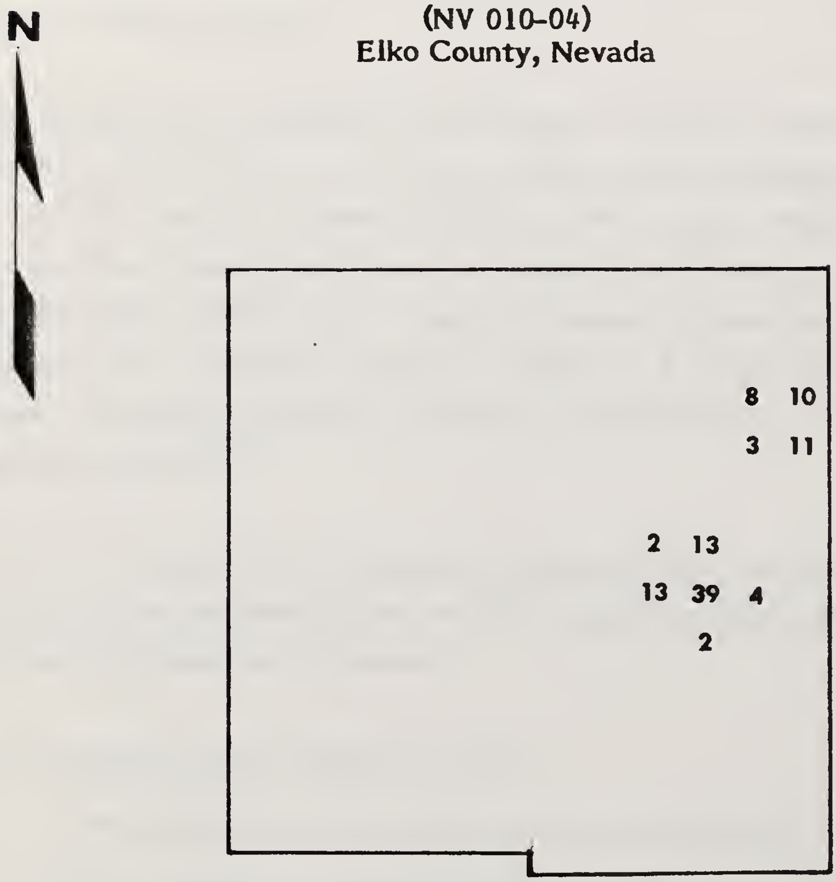
Scale 1:250,000
(Wells $1^{\circ}x2^{\circ}$ NTMS Quadrangle)

This map is an overlay for Figures 2-1 and 2-2.

Explanation for this figure is found in Appendix B: Explanation for Figure 3-2.

FIGURE 3-3

Claims Density Map
Badlands GRA
(NV 010-04)
Elko County, Nevada



n = number of claims per section

Scale 1:250,000
(Wells $1^{o}x2^{o}$ NTMS Quadrangle)

This map is an overlay for Figures 2-1 and 2-2.

3.5 DEPOSIT TYPES

The deposit types anticipated in WSA 010-184 are modeled after deposits known to occur in the Contact Mining District.

Nevada is divided into two distinct metallogenic provinces based on the distribution of known metallic occurrences and related lithologic and stratigraphic considerations. The western half of Nevada is characterized by major gold, silver, tungsten, antimony, mercury, and iron deposits that occur in Paleozoic and Mesozoic silicious and volcanic rocks and Tertiary volcanic rocks. Eastern Nevada is characterized by major lead and zinc deposits with associated gold and silver in Precambrian rocks and Paleozoic carbonates. The study area lies just east of the transition zone between the two metallogenic provinces(4).

Fissure veins and skarn-type replacement bodies similar to the deposits near Contact, Nevada, could occur at depth within the WSA along the contact between the Cretaceous intrusives and the Paleozoic carbonates.

Recognition criteria for such deposits include:

- the existence of the requisite contact relationship;
- the presence of the appropriate carbonate hosts and Mesozoic intermediate to silicic intrusives;
- the presence of skarn and associated desilicified zones within the pluton; and
- the presence of anomalous amounts of associated metals.

3.6 MINERAL ECONOMICS

The Badlands GRA is highly favorable for the occurrence of some metals resources (Cu, Mo, W, Au, Ag, Pb), limestone and phosphate, and moderately favorable for oil and gas, and barite (see Section 2.3).

3.6.1 Copper

The principal consumer of copper in 1981 were the electrical industry, 57 percent; and

the construction industry, 17 percent; and 12 percent of consumption was in industrial machinery; eight percent was used in transportation, and six percent went for other uses. Copper mining and the refining of copper ores has produced the entire domestic supply of primary arsenic, selenium, and tellurium, most of the primary platinum and palladium, nearly 43 percent of the primary gold, 37 percent of the primary silver, and 30 percent of the primary domestic molybdenum[17].

Domestic production of copper fell six percent in July, 1982, whereas net imports declined 17 percent in the same month. This is 14 percent below the July, 1981 level[18]. Consumption of refined copper decreased 24 percent while stockpiles have increased six percent. The price of copper reached an all time high of $1.45 per pound in February, 1980. Although the price has fluctuated, it has declined steadily to around $0.63 to $0.71 per pound in August, 1982[19].

The United States demand for copper is expected to increase at an annual rate of about three percent through 1990[18]. The United States is estimated to have a net import reliance of five percent of apparent copper consumption, as of January, 1982.

3.6.2 Molybdenum

Molybdenum is used primarily in metallurgical applications, catalysts, lubricants, and pigments[20]. Domestic and foreign production of molybdenum exceeded demand in 1981. Consumption in raw materials and apparent domestic demand declined six percent and three percent respectively, relative to the 1980 supply and demand. World-wide demand fell by an estimated five to ten percent. This caused an increase in domestic producer stockpiles of nearly 175 percent. Domestic production of molybdenum concentrate fell 68 percent in July, 1982, compared with the previous month[21]. Year-to-date total consumption fell about 60 percent by July, 1982. It is estimated that in 1982 total domestic mine production of molybdenum will be 147 million pounds, whereas the United States apparent consumption will be 57 million pounds. The United States is a net exporter of molybdenum[22]. The price of molybdenum has decreased from $9.70 per pound to $6.85 per pound since 1981.

3.6.3 Tungsten

Tungsten is used in many different industries. The most dominant use in in metalworking

and machinery, with 78 percent of the United States tungsten consumption; followed by lamps, lighting, and electrical with ten percent; transportation with nine percent; and a variety of other industries consuming three percent of the United States annual tungsten production. Tungsten production in the United States for 1981 was 22 million pounds. Estimated total domestic mine production was about seven million pounds. Purchased scrap metal accounted for nearly 3.5 million pounds of tungsten. The United States import reliance in 1981 is estimated to have been 52 percent of the apparent consumption(23). Domestic consumption of tungsten concentrate decreased nearly 76 percent from July, 1981 to July, 1982. Imports decreased 45 percent in the same period. Reported production and consumption of ammonium paratungstate decreased 72 percent and 64 percent respectively, between July, 1981 and July, 1982(23).

The price of tungsten concentrate in August, 1982, was about $92.00 to 96.00 per short ton unit of WO_3. The General Services Administration offerings in August and September, 1982, of one million pounds of tungsten were not bid. One 1982 estimate predicts a five percent increase in tungsten consumption through 1990(24).

3.6.4 <u>Gold</u>

Jewlery and the arts are estimated to have consumed 54 percent of all the gold used in the United States in 1981. Other consumers include electronic industries, 37 percent; dental, eight percent; and investments, one percent(25). In 1981, 25 mines in the western United States yielded 94 percent of the domestic gold production(26). Nearly 40 percent of the domestic gold production was recovered as a by-product of base metal (chiefly copper) mining. The United States had a net import reliance equal to seven percent of apparent consumption in 1981. Import reliance has decreased steadily to the present level since a high of 61 percent in 1977. Gold prices that reached record levels in January, 1980, declined from $597.00 per troy ounce at the beginning of 1981 to a low of $391.00 in August, 1981. August, 1982 prices averaged $367.00 per troy ounce.

United States consumption of gold increased slightly from 1980 to 1981. It is estimated that 1982 domestic mine production of gold will be 1.6 million troy ounces whereas United States consumption will be about five million troy ounces(26). As of July, 1982, domestic mine production totaled about 730,000 troy ounces(27). Recycled scrap produced 3.9 million troy ounces of gold in 1981. Similar production is anticipated in 1982. Total demand for gold in the United States is expected to increase at an annual rate of about 2.2 percent through 1990(26).

3.6.5 Silver

The photographic industry is the largest consumer of silver in the United States, accounting for about 35 percent of the total United States consumption[28]. Other major uses include electrical and electronic components, 29 percent; sterling-ware, ten percent; alloys and solders, eight percent; and miscellaneous uses, 18 percent. About 55 percent of the domestic production comes from by-product processes of copper, lead, and zinc mining. Estimated domestic mine production of silver in 1982 will be 42 million troy ounces, whereas United States apparent consumption will be 150 million troy ounces. United States consumption in 1981 was about four times domestic mine production, and 39 percent of world production[29]. About 37 percent of the total United States consumption of silver in 1981 was met by recycling scrap silver. This left a deficit net import reliance of 50 percent of the United States silver consumption in 1981. Estimated year end stocks for 1981 totalled 163.8 million troy ounces. The demand for silver is expected to increase at a rate of about three percent through 1990[30]. The average daily price of silver in 1981 was about $11.00 per troy ounce, down about 50 percent from 1980. The price of silver futures at the end of July, 1982, was $6.96 (December, 1982), and is expected to be $7.50 (July, 1982), and $8.12 (March, 1984)[30]. Future United States requirements will be met by increased reliance on imports, secondary recovery, and withdrawal from existing stockpiles.

3.6.6 Lead

Nearly 65 percent of domestic lead consumption is related to the transportation industry: batteries, gasoline additive, etc. Construction, paints, ammunition, and electical supplies consume another 30 percent. The remainder goes into ceramics, glass, type metal, and other minor uses. Total apparent United States consumption in 1981 was estimated to be 950,000 metric tons[31]. Mine production was about 450,000 metric tons. Recovery from scrap supplied 44 percent of reported consumption. In 1980, the United States was a net exporter of lead. In 1981, the United States is estimated to have an import reliance of nearly ten percent of apparent consumption. Extimates of 1982 domestic mine production is 525,000 metric tons to satisfy an estimated total United States consumption of 970,000 metric tons. Demand for lead is expected to increase at an annual rate of 2.5 percent through 1990[31]. The price of lead has varied between $0.30 per pound and $0.45 per pound since 1977.

3.6.7 Limestone

Lime, limestone, and calcined gypsum, are used primarily in steel furnaces, water treatment, Portland cement, paper and pulp, and in the desulfurization of sour gas. Ohio, Pennsylvania, Missouri, Illinois, Texas, Alabama, and Kentucky produce 47 percent of the total output[36, 37]. Although the United States production of lime has increased nearly 14 percent in the last 12 months, it is predicted to increase at an annual rate of two and one-half percent through 1990[36]. The lime market has expanded largely because of environmental regulation of industrial effluents and emissions. Estimated United States consumption of lime will exceed domestic production by 300,000 tons in 1982. Foreign sources of industrial lime products are Canada, 94 percent; and Mexico, six percent. The current average price for lime is $47.00 per ton.

3.6.8 Phosphate

The principal uses of phosphate rock are as fertilizers and animal feed supplements, 88 percent; and industrial and food grade products, 12 percent[38]. The majority (83 percent) of total domestic production came from Florida. Production of phosphate rock for the first eight months of 1982 (annual rate 38.4 million metric tons) was 28 percent lower than in 1981 (annual rate 53.6 million metric tons). Consumption was down 17 percent for the same period.

The United States is a net exporter of phosphate[39]. Average prices of phosphate rock have ranged from about $17.00 per metric ton in 1977 to an estimated $27.00 per metric ton in 1981. The average price for the first six months of 1982 was about $22.00 per metric ton[40]

3.6.9 Oil and Gas

Oil and gas are vitally important to the industrial growth and development of the United States, and to the overall standard of living. Gross supply and demand trends indicate that during the present decade foreign oil will make up at least 45 percent of our national oil requirements. Present domestic production is 8.6 million barrels per day. The United States currentyly has a 37 million barrel per day equivalent energy demand. It is predicted that by 1990 the United States will produce 8.8 million barrels of oil per day. The equivalent energy demand will increase to 40 million barrels per day[32].

During this same period, crude oil demand will decrease by nearly 5 percent, from 16 million barrels per day to 14 million barrels per day equivalent. This decrease is thought to be related to an increase in the use and development of other domestic energy sources, consumer conservation practices, and a predicted slight increase in crude oil production by 1990[32]. Because many (most?) shallow sources of crude have been or are being depleted, deeper, more difficult targets of oil and gas are being sought. This will result in a rise in the price of crude by 1990[32]. This may reverse the trend of surplus supplies that began last year. It may cause shortages[33].

3.6.10 Barite

Barite is used almost exclusively (97 percent) in oil and gas well drilling fluids[34]. Other uses include glass manufactories, and paint, plastics, rubber, flux and oxidizer operations. Domestic production of barite in 1981 rose to a record level of 2.4 million tons. This reflects the increased oil and gas drilling activities in 1981. Apparent consumption for 1981 was 4.2 million tons. Since 1977, the United States has had a net import reliance that varied from 28 percent to 44 percent of the total apparent consumption. The price of barite has varied from about $20.00 per ton in 1977 to $35.50 per ton in 1981[35]. The price, supply and demand for barite will continue to be directly related to oil and gas drilling activity.

3.7 STRATEGIC AND CRITICAL MINERALS AND METALS

Strategic and critical minerals and metals for which the Badlands GRA are favorable include copper, lead, silver, and tungsten. (See Table 3-4 in TERRADATA's report entitled "Procedures for the Assessment of Geology, Energy, and Minerals (GEM) Resources.")

4. CLASSIFICATION OF LAND FOR GEM RESOURCES POTENTIAL

The precise location of specific favorable environments within a given GRA depends upon three principal factors:

- The precision and specificity of avaliable data;
- The nature (size and spatial distribution) of anticipated deposits as predicted from known models; and
- The geometry of the favorable geologic environments.

Commodity-specific information in the Badlands GRA is limited. Therefore, with the exception of the potential skarn environment for metal deposits, the entire area, rather than specific subareas, has been classified for individual GEM resources (Figure 4-1 and Table 4-1).

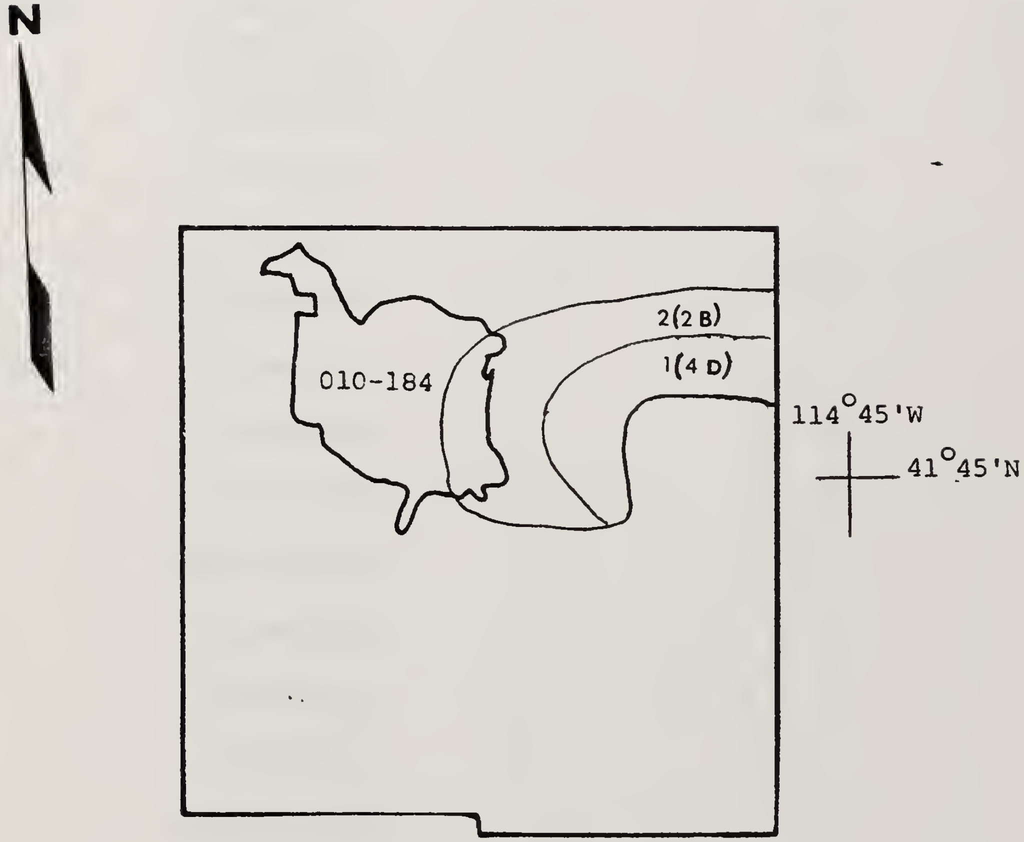
The entire Badlands GRA is highly favorable (Class 4) for potential metaliferous, limestone and phosphate GEM resources because geologic formations that contain these commodities occur within the GRA[15]. The high confidence level (D) of this classification signifies that the available data provide abundant direct and indirect evidence to support the existence of these resources.

The GRA is moderately favorable (Class 3) for potential accumulations of oil and gas[9], paleontology[7], and barite[15] resources. The confidence levels for these classifications range from C to A. The classification (3C) of the GRA for oil and gas resources indicates that the area is moderately favorable for the occurrence of this resource and that there is some direct evidence in the form of borehole data to substantiate this conclusion.

Two areas are classified 2B to 4D for potential metallic resources[10]. The 2B classification signifies a low favorability because, although occurrences are known in the adjacent Contact Mining District, there is no direct evidence of mineralization outside the district. The appropriate geologic environment and inferred geologic processes are assumed to be present in the WSA, however, there is no direct evidence to support this. High favorability and high confidence reflects the known deposits in the Contact Mining District.

FIGURE 4-1

Land Classification Map
Badlands GRA
(NV-010-04)
Elko County, Nevada



Scale 1:250,000
(Wells 1°x2° NTMS Quadrangle)

This map is an overlay for Figures 2-1 and 2-2.

TABLE 4-1

Classification Of Lands Within The Badlands GRA (NV - 010 - 04) Elko County, Nevada For GEM Resource Potential

COMMODITY	AREA	CLASSIFICATION LEVEL	CONFIDENCE LEVEL	REMARKS
Metals/Non-Metals	Area 1-4D	4	D	Cu, Mo, W,
	Area 2-2B	2	B	Au, Ag, Pb
	Rest of GRA	1	B	
Geothermal	Entire GRA	1	D	
Uranium/Thorium	Entire GRA	1	A	
Coal	Entire GRA	1	C	
Oil and Gas	Entire GRA	3	C	
Tar Sands/Oil Shale	Entire GRA	1	C	
Limestone	Entire GRA	4	D	
Bentonite	Entire GRA	2	A	
Diatomite	Entire GRA	1	B	
Clinoptilolite	Entire GRA	1	A	
Barite	Entire GRA	3	A	
Turquoise	Entire GRA	2	A	
Perlite	Entire GRA	1	A	
Phosphate	Entire GRA	4	D	
Paleontology	Entire GRA	3	B	
Hazards	See Hazards Map (GRA File)			
ESLs	None	1	C	

LEGEND:
Class 1 - Least Favorable
Class 2 - Low Favorability
Class 3 - Moderate Favorability
Class 4 - High Favorability

Confidence Level A - Insufficient data or no direct evidence
Confidence Level B - Indirect evidence available
Confidence Level C - Direct evidence but quantitatively minimal
Confidence Level D - Abundant direct and indirect evidence

The GRA has low favorability (Class 2) for bentonite and turquoise resources. The classifications of the GRA for both of these resources have low confidence levels because the available data cannot be considered as direct evidence to support or refute the evaluations.

The GRA exhibits no favorable characteristics (Class 1) for any other GEM resources (Table 4-1). The classification of the area for potential geothermal resources has the highest confidence level (D). The information available provide abundant evidence to refute the possibility of the existence of any geologic environment that is favorable for geothermal resources[12].

TERRADATA's classification of this area for leasable resources agrees with the USGS classification of the same area[41, 42, 43, 44, 45, 46].

5. RECOMMENDATIONS FOR FUTURE WORK

Further surface geologic investigations, including detailed mapping and stratigraphic studies, in the Badlands GRA should be designed to increase the confidence levels of the classifications. Detailed surface investigations should be undertaken for recognition criteria for industrial minerals (e.g., weathering phenomena, evidence of altered volcanic rocks); and for metallic deposits, (e.g., soil geochemistry, stream sediment analyses, etc). With the exception of either geophysical investigations or drilling, future work should be confined to detailed mapping, sampling, and general field exploration. Detailed gravity surveys within the WSA would help delineate the subsurface orientation of the Contact stock. This would have a direct bearing on the estimated depth to potential mineral zones. These studies could potentially alter the classification of the area for metallic GEM resources.

- APPENDIX A -

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45. Godwin, L.H., and Dokter, R.; 1981; Lands Valuable for Coal Map for the State of Nevada; Revised, United States Geological Survey, Mineral Management Service, Menlo Park, California, Scale 1:250,000.

46. Lee, Robert E.; 1980; Lands Valuable for Oil Shale Map for the State of Nevada; Revised, United States Geological Survey, Mineral Management Service, Menlo Park, California, Scale 1:250,000.

- APPENDIX B -

Explanation For Figure 3-2

FIGURE 3–2

(Explanation)

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  118
73 NAME- INDEPENDENCE CLAIMS (NOS.1-10)        REFERENCE NUMBER- 0320070429
   STATE- NEVADA                      COUNTY- ELKO                          ELEV:PREC- 1719M:500M
   LATITUDE-    N 41 39 26          PRECISION-    1KM
   LONGITUDE- W 114 48 35  REFERENCE POINT- APPROX
   UTM:  ZONE 11N  NORTHING 4613823  EASTING 682374
   PUBLIC LAND SURVEY  TOWNSHIP- 044 N   RANGE- 063 E
       DESCRIPTION      SECTION- 35  SECTION SUBDIVISION-
   RIVER BASIN- 79L   SALMON FALLS CREEK          DOMAIN- BLM ADMIN
   STATUS- UNKNOWN         OPERATION TYPE- MINERAL LOC
   VESA ID NO.           YEAR FIELD CHECKED-       MAP REPOSITORY-  FOC
   MAP NAME- HENRY                  TYPE- 7.5 MIN
   1:250.000 MAP NAME- WELLS                  MINERAL PROPERTY FILE-
   PRIMARY NAME- INDEPENDENCE CLAIMS (NOS.1-10)
   COMMOD/MOD-  COPPER
   NEVADA BUREAU OF MINES & GEOLOGY, BULL 81 1973 P.43
   U.S.ATOMIC ENERGY COMM.PRELIM.RECONN.REPT.3407.

  172
99 NAME- IVY WILSON                            REFERENCE NUMBER- 0320070162
   STATE- NEVADA                      COUNTY- ELKO                          ELEV:PREC- 1908M:500M
   LATITUDE-    N 41 44 03          PRECISION-   100M
   LONGITUDE- W 114 49 58  REFERENCE POINT- MAIN ENT
   UTM:  ZONE 11N  NORTHING 4622317  EASTING 680239
   PUBLIC LAND SURVEY  TOWNSHIP- 044 N   RANGE- 063 E
       DESCRIPTION      SECTION- 03  SECTION SUBDIVISION- N2NW
   RIVER BASIN- 79L   SALMON FALLS CREEK          DOMAIN- BLM ADMIN
   STATUS- UNKNOWN         OPERATION TYPE- MINERAL LOC
   VESA ID NO.           YEAR FIELD CHECKED-       MAP REPOSITORY-  FOC
   MAP NAME- HENRY                  TYPE- 7.5 MIN
   1:250.000 MAP NAME- WELLS                  MINERAL PROPERTY FILE-
   PRIMARY NAME- IVY WILSON
   OTHER NAMES-  NEVADA MINE
                 SUE GROUP OF IVY WILSON CLAIMS
   COMMOD/MOD-  COPPER                                        SILVER
   NEV BUR MIN BULL 54, 1957,PT.5
   USGS BULL 847-A, 1935, PP.35-36, PL.3.
   USGS BULL 497, 1912, PP.129-13.
   NEV BUR MIN RPT.2, 1962, P.12.

  173
99 NAME- SEMSCO PROPERTY                       REFERENCE NUMBER- 0320070428
   STATE- NEVADA                      COUNTY- ELKO                          ELEV:PREC- 1798M:500M
   LATITUDE-    N 41 43 50          PRECISION-    1KM
   LONGITUDE- W 114 49 40  REFERENCE POINT- APPROX
   UTM:  ZONE 11N  NORTHING 4621927  EASTING 680665
   PUBLIC LAND SURVEY  TOWNSHIP- 044 N   RANGE- 063 E
       DESCRIPTION      SECTION- 03  SECTION SUBDIVISION-
   RIVER BASIN- 79L   SALMON FALLS CREEK          DOMAIN- BLM ADMIN
   STATUS- UNKNOWN         OPERATION TYPE- MINERAL LOC
   VESA ID NO.           YEAR FIELD CHECKED-       MAP REPOSITORY-  FOC
   MAP NAME- HENRY                  TYPE- 7.5 MIN
   1:250.000 MAP NAME- WELLS                  MINERAL PROPERTY FILE-
   PRIMARY NAME- SEMSCO PROPERTY
   COMMOD/MOD-  COPPER
   NEVADA BUREAU OF MINES & GEOLOGY, BULL 81 1973 P.43
   U.S.ATOMIC ENERGY COMM.PRELIM.RECONN.REPT.3406.
   ALSO SEC 4
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FIGURE 3-2

(Explanation Continued)

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  194
108 NAME- FLORENCE NO. 16 CLAIM                        REFERENCE NUMBER- 0320070448
    STATE- NEVADA                   COUNTY- ELKO                        ELEV:PREC- 1829M:500M
    LATITUDE-   N 41 45 30          PRECISION-    1KM
    LONGITUDE- W 114 47 58  REFERENCE POINT- MAIN ENT
    UTM:  ZONE 11N  NORTHING 4625071  EASTING 682943
    PUBLIC LAND SURVEY  TOWNSHIP- 045 N   RANGE- 063 E
        DESCRIPTION     SECTION- 25  SECTION SUBDIVISION- L2L2
    RIVER BASIN- 79L    SALMON FALLS CREEK          DOMAIN- PRIVATE
    STATUS- UNKNOWN          OPERATION TYPE- UNDERGROUND
    MESA ID NO.            YEAR FIELD CHECKED-       MAP REPOSITORY-   FOC
    MAP NAME- CONTACT               TYPE- 15 MIN
    1:250,000 MAP NAME- WELLS                   MINERAL PROPERTY FILE-
    PRIMARY NAME- FLORENCE NO. 16 CLAIM
    COMMOD/MOD-  MOLYBDENUM
    NEV BUR MINES RPT.2 1962 PP.11&12
    USGS BULL 497, 1912, PP.132-133, PL.19.

  195
108 NAME- GRAY                                         REFERENCE NUMBER- 0320070551
    STATE- NEVADA                   COUNTY- ELKO                        ELEV:PREC- 1951M:100M
    LATITUDE-   N 41 45 26          PRECISION-    1KM
    LONGITUDE- W 114 48 54  REFERENCE POINT- ORE BODY
    UTM:  ZONE 11N  NORTHING 4624915  EASTING 681652
    PUBLIC LAND SURVEY  TOWNSHIP- 045 N   RANGE- 063 E
        DESCRIPTION     SECTION- 26  SECTION SUBDIVISION-
    RIVER BASIN- 79L                                DOMAIN- BLM ADMIN
    STATUS- PAST PRODUCER  OPERATION TYPE- UNKNOWN
    MESA ID NO.            YEAR FIELD CHECKED-       MAP REPOSITORY-   FOC
    MAP NAME- CONTACT               TYPE- 15 MIN
    1:250,000 MAP NAME- WELLS                   MINERAL PROPERTY FILE-
    PRIMARY NAME- GRAY
    COMMOD/MOD-  LEAD                                          COPPER
                 SILVER                                        GOLD
    SMITH, ROSCOE M. MINERAL RESOURCES OF ELKO COUNTY, NEVADA.
      U.S. GEOL. SURVEY. OPEN-FILE REPORT 1976-56, 1976, P.41.

  219
116 NAME- BELLEVUE MINE                                REFERENCE NUMBER- 0320070071
    STATE- NEVADA                   COUNTY- ELKO                        ELEV:PREC- 1890M:500M
    LATITUDE-   N 41 46 42          PRECISION-  100M
    LONGITUDE- W 114 47 13  REFERENCE POINT- MAIN ENT
    UTM:  ZONE 11N  NORTHING 4627318  EASTING 683925
    PUBLIC LAND SURVEY  TOWNSHIP- 045 N   RANGE- 063 E
        DESCRIPTION     SECTION- 24  SECTION SUBDIVISION- NWNWNE
    RIVER BASIN- 79L    SALMON FALLS CREEK          DOMAIN- UNKNOWN
    STATUS- PAST PRODUCER  OPERATION TYPE- SURF-UNDERG
    MESA ID NO.            YEAR FIELD CHECKED-       MAP REPOSITORY- WFOC
    MAP NAME- CONTACT               TYPE- 15 MIN
    1:250,000 MAP NAME- WELLS                   MINERAL PROPERTY FILE-
    PRIMARY NAME- BELLEVUE MINE
    COMMOD/MOD-  COPPER                                        GOLD
                 SILVER
    USGS BULL 847-A, 1935, PP.23-25.  FIG-4.
    NEV BUR MIN BULL 54, 1957, P.38,  PL.6,7.
    OWNED & OPERATED BY MARSHALL MIN. CO., SEQ. NO. 3200700334.
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FIGURE 3-2

(Explanation Continued)

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  220
116 NAME- BROOKLYN MINE                          REFERENCE NUMBER- 0320070079
    STATE- NEVADA                  COUNTY- ELKO                          ELEV:PREC- 1890M:500M
    LATITUDE-   N 41 46 49        PRECISION-  100M
    LONGITUDE- W 114 47 08  REFERENCE POINT- MAIN ENT
    UTM:  ZONE 11N  NORTHING 4627537  EASTING 684035
    PUBLIC LAND SURVEY  TOWNSHIP- 045 N   RANGE- 063 E
        DESCRIPTION     SECTION- 25  SECTION SUBDIVISION- S2SE
    RIVER BASIN- 79L   SALMON FALLS CREEK         DOMAIN- UNKNOWN
    STATUS- PAST PRODUCER  OPERATION TYPE- UNDERGROUND
    MESA ID NO.            YEAR FIELD CHECKED-       MAP REPOSITORY-  FOC
    MAP NAME- CONTACT              TYPE- 15 MIN
    1:250.000 MAP NAME- WELLS                 MINERAL PROPERTY FILE-
    PRIMARY NAME- BROOKLYN MINE
    COMMOD/MOD-  COPPER                                      SILICON
                 MOLYBDENUM
    USGS BULL 847-A, 1935, PP.19-22,  FIGS.2,3.
    USGS BULL 497, 1912, PP.117-119,  PL.14.
    NEV BUR MIN BULL 54, 1957, PL.6.
    OWNED & OPERATED BY MARSHALL MIN. CO., SEQ. NO. 3200700334.

  221
116 NAME- COPPER SHIELD GROUP                    REFERENCE NUMBER- 0320070447
    STATE- NEVADA                  COUNTY- ELKO                          ELEV:PREC- 1902M:500M
    LATITUDE-   N 41 46 04        PRECISION-  1KM
    LONGITUDE- W 114 47 18  REFERENCE POINT- MAIN ENT
    UTM:  ZONE 11N  NORTHING 4626143  EASTING 683839
    PUBLIC LAND SURVEY  TOWNSHIP- 045 N   RANGE- 063 E
        DESCRIPTION     SECTION- 24  SECTION SUBDIVISION- S2
    RIVER BASIN- 79L   SALMON FALLS CREEK         DOMAIN- BLM ADMIN
    STATUS- UNKNOWN        OPERATION TYPE- UNDERGROUND
    MESA ID NO.            YEAR FIELD CHECKED-       MAP REPOSITORY-  FOC
    MAP NAME- CONTACT              TYPE- 15 MIN
    1:250.000 MAP NAME- WELLS                 MINERAL PROPERTY FILE-
    PRIMARY NAME- COPPER SHIELD GROUP
    OTHER NAMES-  EFFIE FAY GROUP
    COMMOD/MOD-  COPPER                                      MOLYBDENUM
    NEV BUR MINES RPT.2 1962 P.11
    USGS BULL. 497, 1912, PP 132-133, PL.19.
    USGS BULL. 847, 1935, P.37.
    ALSO SEC. 19, T.45 N, R.64 E

  222
116 NAME- DETWEILER MINE                         REFERENCE NUMBER- 0320070157
    STATE- NEVADA                  COUNTY- ELKO                          ELEV:PREC- 1835M:500M
    LATITUDE-   N 41 47 03        PRECISION-  100M
    LONGITUDE- W 114 46 13  REFERENCE POINT- MAIN ENT
    UTM:  ZONE 11N  NORTHING 4628002  EASTING 685294
    PUBLIC LAND SURVEY  TOWNSHIP- 045 N   RANGE- 064 E
        DESCRIPTION     SECTION- 18  SECTION SUBDIVISION- SWNWSE
    RIVER BASIN- 79L   SALMON FALLS CREEK         DOMAIN- BLM ADMIN
    STATUS- PAST PRODUCER  OPERATION TYPE- UNDERGROUND
    MESA ID NO.            YEAR FIELD CHECKED-       MAP REPOSITORY-  FOC
    MAP NAME- CONTACT              TYPE- 15 MIN
    1:250.000 MAP NAME- WELLS                 MINERAL PROPERTY FILE-
    PRIMARY NAME- DETWEILER MINE
    OTHER NAMES-  DELANO GROUP
                  COPPER KING
                  FULTON
    COMMOD/MOD-  COPPER
    USGS BULL 847-A, 1935, P.29, FIG.4
    NEV BUR MIN BULL 54, 1957, PL.6.
    OWNED & OPERATED BY MARSHALL MIN. CO., SEQ. NO. 3200700334.
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FIGURE 3-2

(Explanation Continued)

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  223
116 NAME- EMPIRE MINE                               REFERENCE NUMBER- 0320070164
    STATE- NEVADA                   COUNTY- ELKO                     ELEV:PREC- 1890M:500M
    LATITUDE-    N 41 46 39         PRECISION-  100M
    LONGITUDE- W 114 47 17  REFERENCE POINT- MAIN ENT
    UTM:  ZONE 11N  NORTHING 4627193  EASTING 683836
    PUBLIC LAND SURVEY  TOWNSHIP- 045 N   RANGE- 063 E
        DESCRIPTION     SECTION- 24  SECTION SUBDIVISION- SWNWNE
    RIVER BASIN- 79L   SALMON FALLS CREEK          DOMAIN- UNKNOWN
    STATUS  PAST PRODUCER  OPERATION TYPE- UNDERGROUND
    MESA ID NO.            YEAR FIELD CHECKED-       MAP REPOSITORY-  FOC
    MAP NAME- CONTACT              TYPE- 15 MIN
    1:250,000 MAP NAME- WELLS                    MINERAL PROPERTY FILE-
    PRIMARY NAME- EMPIRE MINE
    COMMOD MOD-  COPPER
    USGS BULL 497, 1912, P.119.
    USGS BULL 847-A, 1935, P.22.

  224
116 NAME- ETHIOPIA                                  REFERENCE NUMBER- 0320070572
    STATE- NEVADA                   COUNTY- ELKO                     ELEV:PREC- 1902M:100M
    LATITUDE-    N 41 46 04         PRECISION-   1KM
    LONGITUDE- W 114 47 18  REFERENCE POINT- MAIN ENT
    UTM:  ZONE 11N  NORTHING 4626144  EASTING 683839
    PUBLIC LAND SURVEY  TOWNSHIP- 045 N   RANGE- 063 E
        DESCRIPTION     SECTION- 24  SECTION SUBDIVISION-
    RIVER BASIN- 79L                               DOMAIN- BLM ADMIN
    STATUS  PAST PRODUCER  OPERATION TYPE- UNKNOWN
    MESA ID NO.            YEAR FIELD CHECKED-       MAP REPOSITORY-  FOC
    MAP NAME- CONTACT              TYPE- 15 MIN
    1:250,000 MAP NAME- WELLS                    MINERAL PROPERTY FILE-
    PRIMARY NAME- ETHIOPIA
    OTHER NAMES-  ETHIOPIA
    COMMOD/MOD-  COPPER                                       SILVER
                 GOLD
    SMITH, ROSCOE M. MINERAL RESOURCES OF ELKO COUNTY, NEVADA.
      U.S. GEOL. SURVEY. OPEN-FILE REPORT 1976-56. 1976, P. 41.

   U.S. BUREAU OF MINES. PERMANENT INDIVIDUAL MINE PRODUCTION
     RECORD FILE. WESTERN FIELD OPERATIONS CENTER, SPOKANE, WA.
     P. 40.

  225
116 NAME- GRAND VIEW                                REFERENCE NUMBER- 0320070573
    STATE- NEVADA                   COUNTY- ELKO                     ELEV:PREC- 1914M:100M
    LATITUDE-    N 41 46 43         PRECISION-   1KM
    LONGITUDE- W 114 47 34  REFERENCE POINT- ORE BODY
    UTM:  ZONE 11N  NORTHING 4627337  EASTING 683439
    PUBLIC LAND SURVEY  TOWNSHIP- 045 N   RANGE- 063 E
        DESCRIPTION     SECTION- 24  SECTION SUBDIVISION-
    RIVER BASIN- 79L                               DOMAIN- BLM ADMIN
    STATUS  PAST PRODUCER  OPERATION TYPE- UNKNOWN
    MESA ID NO.            YEAR FIELD CHECKED-       MAP REPOSITORY-  FOC
    MAP NAME- CONTACT              TYPE- 15 MIN
    1:250,000 MAP NAME- WELLS                    MINERAL PROPERTY FILE-
    PRIMARY NAME- GRAND VIEW
    COMMOD/MOD-  COPPER                                       SILVER
    SMITH, ROSCOE M. MINERAL RESOURCES OF ELKO COUNTY, NEVADA.
      U.S. GEOL. SURVEY. OPEN-FILE REPORT 1976-56. 1976, P. 41.
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FIGURE 3-2

(Explanation Continued)

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   226
116 NAME- HICKEY PROSPECT                              REFERENCE NUMBER- 0320070224
    STATE- NEVADA                    COUNTY- ELKO                       ELEV:PREC- 1847M:500M
    LATITUDE-    N 41 47 29          PRECISION-   100M
    LONGITUDE- W 114 47 00  REFERENCE POINT- MAIN ENT
    UTM:  ZONE 11N  NORTHING 4628775  EASTING 684188
    PUBLIC LAND SURVEY  TOWNSHIP- 045 N    RANGE- 063 E
        DESCRIPTION      SECTION- 13  SECTION SUBDIVISION- SWNENE
    RIVER BASIN- 79L   SALMON FALLS CREEK          DOMAIN- BLM ADMIN
    STATUS- PAST PRODUCER  OPERATION TYPE- MINERAL LOC
    MESA ID NO.            YEAR FIELD CHECKED-        MAP REPOSITORY-  FOC
    MAP NAME- CONTACT               TYPE- 15 MIN
    1:250,000 MAP NAME- WELLS                    MINERAL PROPERTY FILE-
    PRIMARY NAME- HICKEY PROSPECT
    OTHER NAMES-  LEAD-SILVER MINE
                  JONES MINE
    COMMOD/MOD-  LEAD                                          SILVER
                 GOLD                                          COPPER
                 ZINC
    USGS BULL 497, 1912, P.134.
    USGS BULL 847-A, 1935, PP.30-31,  PL.2,3.


   227
116 NAME- LIBERTY BELL                                 REFERENCE NUMBER- 0320070580
    STATE- NEVADA                    COUNTY- ELKO                       ELEV:PREC- 1975M:100M
    LATITUDE-    N 41 46 30          PRECISION-    1KM
    LONGITUDE- W 114 47 56  REFERENCE POINT- ORE BODY
    UTM:  ZONE 11N  NORTHING 4626923  EASTING 682941
    PUBLIC LAND SURVEY  TOWNSHIP- 045 N    RANGE- 063 E
        DESCRIPTION      SECTION- 23  SECTION SUBDIVISION-
    RIVER BASIN- 79L                                 DOMAIN- BLM ADMIN
    STATUS- PAST PRODUCER  OPERATION TYPE- UNKNOWN
    MESA ID NO.            YEAR FIELD CHECKED-        MAP REPOSITORY-  FOC
    MAP NAME- CONTACT               TYPE- 15 MIN
    1:250,000 MAP NAME- WELLS                    MINERAL PROPERTY FILE-
    PRIMARY NAME- LIBERTY BELL
    COMMOD/MOD-  COPPER                                        SILVER
    SMITH, ROSCOE M. MINERAL RESOURCES OF ELKO COUNTY, NEVADA.
      U.S. GEOL. SURVEY. OPEN-FILE REPORT 1976-56. 1976, P. 41.

   228
116 NAME- MARSHALL MINE                                REFERENCE NUMBER- 0320070334
    STATE- NEVADA                    COUNTY- ELKO                       ELEV:PREC- 1817M:100M
    LATITUDE-    N 41 46 54          PRECISION-   100M
    LONGITUDE- W 114 46 38  REFERENCE POINT- MAIN ENT
    UTM:  ZONE 11N  NORTHING 4627709  EASTING 684723
    PUBLIC LAND SURVEY  TOWNSHIP- 045 N    RANGE- 064 E
        DESCRIPTION      SECTION- 18  SECTION SUBDIVISION- SESE
    RIVER BASIN- 79L   SALMON FALLS CREEK          DOMAIN- UNKNOWN
    STATUS- PAST PRODUCER  OPERATION TYPE- UNDERGROUND
    MESA ID NO.            YEAR FIELD CHECKED-        MAP REPOSITORY-  FOC
    MAP NAME- CONTACT               TYPE- 15 MIN
    1:250,000 MAP NAME- WELLS                    MINERAL PROPERTY FILE- 21.011
    PRIMARY NAME- MARSHALL MINE
    OTHER NAMES-  DELLANO
    COMMOD/MOD-  COPPER                                        GOLD
                 SILVER
    MARSHALL OWNERSHIP INCLUDES THE FOLLOWING: BROOKLYN MINE, DI
       AIM, ALLEN CLAIM, COPPER KING CLAIM, DETWILER MINE, BELLV
    U.S.G.S. BULL. 497, 1912, PP. 119 & 121 - 122, PL. 14, 19.
    U.S.G.S. BULL. 847-A, 1935, PP. 22 - 26, PL. 2,4, FIG. 4.
    SMITH, ROSCOE M. MINERAL RESOURCES OF ELKO COUNTY, NEVADA.
    USGS OPEN FILE REPORT 1976-56, 1976, P. 40.
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FIGURE 3-2

(Explanation Continued)

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   229
116 NAME- PALO ALTO MINE                        REFERENCE NUMBER- 0320070158
    STATE- NEVADA                  COUNTY- ELKO                       ELEV:PREC- 1829M:500M
    LATITUDE-   N 41 46 50         PRECISION-  100M
    LONGITUDE- W 114 46 17  REFERENCE POINT- MAIN ENT
    UTM:  ZONE 11N  NORTHING 4627598  EASTING 685212
    PUBLIC LAND SURVEY  TOWNSHIP- 045 N   RANGE- 064 E
        DESCRIPTION      SECTION- 19  SECTION SUBDIVISION- NENENW
    RIVER BASIN- 79L   SALMON FALLS CREEK        DOMAIN- BLM ADMIN
    STATUS- PAST PRODUCER  OPERATION TYPE- MINERAL LOC
    MESA ID NO.            YEAR FIELD CHECKED-      MAP REPOSITORY-  FOC
    MAP NAME- CONTACT              TYPE- 15 MIN
    1:250,000 MAP NAME- WELLS                MINERAL PROPERTY FILE- 21.099
    PRIMARY NAME- PALO ALTO MINE
    COMMOD/MOD-  COPPER                                        GOLD
                 SILVER
    NEV. BUR. OF MINES BULL. 54, 1957, P.38
    USGS BULL. 497, 1912, P.120, PL.14, 15-A
    USGS BULL. 847-A, 1935, PP. 26-28, PL.2, FIG. 5
    MULTIPLE PROPERTY STUDY - - MPF DATA FILED UNDER 03200/0159

   230
116 NAME- QUEEN OF THE HILLS MINE               REFERENCE NUMBER- 0320070345
    STATE- NEVADA                  COUNTY- ELKO                       ELEV:PREC- 2012M:100M
    LATITUDE-   N 41 46 51         PRECISION-  100M
    LONGITUDE- W 114 47 49  REFERENCE POINT- MAIN ENT
    UTM:  ZONE 11N  NORTHING 4627575  EASTING 683087
    PUBLIC LAND SURVEY  TOWNSHIP- 045 N   RANGE- 063 E
        DESCRIPTION      SECTION- 13  SECTION SUBDIVISION- SWSW
    RIVER BASIN- 79L   SALMON FALLS CREEK        DOMAIN- UNKNOWN
    STATUS- UNKNOWN         OPERATION TYPE- MINERAL LOC
    MESA ID NO.            YEAR FIELD CHECKED-      MAP REPOSITORY- WFOC
    MAP NAME- CONTACT              TYPE- 15 MIN
    1:250,000 MAP NAME- WELLS                MINERAL PROPERTY FILE- 21.088
    PRIMARY NAME- QUEEN OF THE HILLS MINE
    OTHER NAMES-  SILVER CIRCLE MINE
    COMMOD/MOD-  COPPER
    USGS BULL. 847-A, 1935, PP. 31-32, PL. 2
    USGS BULL. 497, 1912, PP. 123-124, PL. 19
    SMITH, ROSCOE M, MINERAL RESOURCES OF ELKO COUNTY, NEVADA.
    USGS OPEN FILE REPORT 1976-56, 1976, P. 42.

   231
116 NAME- RATTLER MINE                          REFERENCE NUMBER- 0320070225
    STATE- NEVADA                  COUNTY- ELKO                       ELEV:PREC- 2054M:500M
    LATITUDE-   N 41 46 56         PRECISION-  100M
    LONGITUDE- W 114 48 10  REFERENCE POINT- MAIN ENT
    UTM:  ZONE 11N  NORTHING 4627717  EASTING 682598
    PUBLIC LAND SURVEY  TOWNSHIP- 045 N   RANGE- 063 E
        DESCRIPTION      SECTION- 11  SECTION SUBDIVISION- SESE
    RIVER BASIN- 79L   SALMON FALLS CREEK        DOMAIN- PRIVATE
    STATUS- PAST PRODUCER  OPERATION TYPE- UNDERGROUND
    MESA ID NO.            YEAR FIELD CHECKED-      MAP REPOSITORY-  FOC
    MAP NAME- CONTACT              TYPE- 15 MIN
    1:250,000 MAP NAME- WELLS                MINERAL PROPERTY FILE- 21.099
    PRIMARY NAME  RATTLER MINE
    COMMOD MOD-  COPPER                                        SILVER
    USGS BULL 497, 1912, P.124, PL.19.
    USGS BULL 847-A, 1935, PP.32-33.
    MULTIPLE PROPERTY STUDY - - MPF DATA FILED UNDER 03200/0159
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FIGURE 3-2

(Explanation Continued)

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  234
119 NAME- ALICE MINE                              REFERENCE NUMBER- 0320070446
    STATE- NEVADA                  COUNTY- ELKO                           ELEV:PREC- 2104M:500M
    LATITUDE-    N 41 46 57        PRECISION-   500M
    LONGITUDE- W 114 48 56  REFERENCE POINT- MAIN ENT
    UTM:  ZONE 11N  NORTHING 4627721  EASTING 681535
    PUBLIC LAND SURVEY  TOWNSHIP- 045 N   RANGE- 063 E
        DESCRIPTION     SECTION- 14  SECTION SUBDIVISION- SW
    RIVER BASIN- 79L   SALMON FALLS CREEK        DOMAIN- BLM ADMIN
    STATUS- PAST PRODUCER  OPERATION TYPE- UNDERGROUND
    MESA ID NO.           YEAR FIELD CHECKED-       MAP REPOSITORY-   FOC
    MAP NAME- CONTACT              TYPE- 15 MIN
    1:250,000 MAP NAME- WELLS                  MINERAL PROPERTY FILE-
    PRIMARY NAME- ALICE MINE
    COMMOD/MOD-  MOLYBDENUM
    U.S.G.S. BULL. 847-A, 1935, P.33.
    U.S.G.S. BULL. 497, 1912, PL.19
    NEV BUR MINES REPT.2, 1962, P.3

  235
119 NAME- BONANZA                                 REFERENCE NUMBER- 0320070161
    STATE- NEVADA                  COUNTY- ELKO                           ELEV:PREC- 2194M:500M
    LATITUDE-    N 41 45 40        PRECISION-   100M
    LONGITUDE- W 114 50 00  REFERENCE POINT- MAIN ENT
    UTM:  ZONE 11N  NORTHING 4627158  EASTING 680071
    PUBLIC LAND SURVEY  TOWNSHIP- 045 N   RANGE- 063 E
        DESCRIPTION     SECTION- 21  SECTION SUBDIVISION- NENW
    RIVER BASIN- 79L   SALMON FALLS CREEK        DOMAIN- PRIVATE
    STATUS- PAST PRODUCER  OPERATION TYPE- MINERAL LOC
    MESA ID NO.           YEAR FIELD CHECKED-       MAP REPOSITORY-   FOC
    MAP NAME- CONTACT              TYPE- 15 MIN
    1:250.000 MAP NAME- WELLS                  MINERAL PROPERTY FILE-
    PRIMARY NAME- BONANZA
    COMMOD/MOD-  COPPER                                         SILVER
                 MOLYBDENUM
    NEV BUR OF MINES BULL 54,1957,P.39,PT.5
    USGS BULL 497, 1912, PP.126-129, PL.14,19.
    USGS BULL 847-A, 1935, P.35, PL.2.
    NEV BUR MIN RPT 2, 1962, P.10

  236
119 NAME- GRAY COPPER                             REFERENCE NUMBER- 0320070546
    STATE- NEVADA                  COUNTY- ELKO                           ELEV:PREC- 2109M:100M
    LATITUDE-    N 41 46 19        PRECISION-   1KM
    LONGITUDE- W 114 50 30  REFERENCE POINT- ORE BODY
    UTM:  ZONE 11N  NORTHING 4626424  EASTING 679394
    PUBLIC LAND SURVEY  TOWNSHIP- 045 N   RANGE- 063 E
        DESCRIPTION     SECTION- 21  SECTION SUBDIVISION-
    RIVER BASIN- 79L                             DOMAIN- BLM ADMIN
    STATUS- PAST PRODUCER  OPERATION TYPE- UNKNOWN
    MESA ID NO.           YEAR FIELD CHECKED-       MAP REPOSITORY-   FOC
    MAP NAME- CONTACT              TYPE- 15 MIN
    1:250.000 MAP NAME- WELLS                  MINERAL PROPERTY FILE-
    PRIMARY NAME- GRAY COPPER
    COMMOD/MOD-  COPPER                                         SILVER
                 GOLD
    SMITH, ROSCOE M. MINERAL RESOURCES OF ELKO COUNTY, NEVADA.
      U.S. GEOL. SURVEY. OPEN-FILE REPORT 1976-56. 1976, P. 41.
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FIGURE 3-2

(Explanation Continued)

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  237
119 NAME- HELEN B SMITH TUNNEL                    REFERENCE NUMBER- 0320070054
    STATE- NEVADA                  COUNTY- ELKO                    ELEV:PREC- 2231M: 10M
    LATITUDE-    N 41 46 55        PRECISION-    1KM
    LONGITUDE- W 114 49 54  REFERENCE POINT- APPROX
    UTM:  ZONE 11N  NORTHING 4627625  EASTING 680198
    PUBLIC LAND SURVEY  TOWNSHIP- 045 N   RANGE- 063 E
        DESCRIPTION      SECTION- 15  SECTION SUBDIVISION- SESW
    RIVER BASIN- 79L   SALMON FALLS CREEK        DOMAIN- UNKNOWN
    STATUS- PAST PRODUCER  OPERATION TYPE- UNDERGROUND
    MESA ID NO.           YEAR FIELD CHECKED-       MAP REPOSITORY- WFOC
    MAP NAME- CONTACT              TYPE- 15 MIN
    1:250,000 MAP NAME- WELLS                  MINERAL PROPERTY FILE- 21.099
    PRIMARY NAME- HELEN B SMITH TUNNEL
    OTHER NAMES-  HELEN B TUNNEL
                  GRAY COPPER CORP. TUNNEL
    COMMOD/MOD-  COPPER                                     SILVER
                 GOLD                                       LEAD
                 MOLYBDENUM
    USGS BULL 847-A, 1935, PP.34-35,PL.1,2.
    NEV BUR OF MINES RPT. #2, 1962, P.10.
    MULTIPLE PROPERTY STUDY - - MPF DATA FILED UNDER 0320070159

  238
119 NAME- MAGNOLIA CLAIM                          REFERENCE NUMBER- 0320070226
    STATE- NEVADA                  COUNTY- ELKO                    ELEV:PREC- 2158M:500M
    LATITUDE-    N 41 46 57        PRECISION-   500M
    LONGITUDE- W 114 49 18  REFERENCE POINT- MAIN ENT
    UTM:  ZONE 11N  NORTHING 4627708  EASTING 681027
    PUBLIC LAND SURVEY  TOWNSHIP- 045 N   RANGE- 063 E
        DESCRIPTION      SECTION- 15  SECTION SUBDIVISION- SESE
    RIVER BASIN- 79L   SALMON FALLS CREEK        DOMAIN- BLM ADMIN
    STATUS- PAST PRODUCER  OPERATION TYPE- UNDERGROUND
    MESA ID NO.           YEAR FIELD CHECKED-       MAP REPOSITORY-  FOC
    MAP NAME- CONTACT              TYPE- 15 MIN
    1:250,000 MAP NAME- WELLS                  MINERAL PROPERTY FILE-
    PRIMARY NAME- MAGNOLIA CLAIM
    COMMOD/MOD-  COPPER
    USGS BULL 497, 1912, PL.19.
    USGS BULL 847-A, 1935, P.33.

  239
119 NAME- MAMMOTH                                 REFERENCE NUMBER- 0320070160
    STATE- NEVADA                  COUNTY- ELKO                    ELEV:PREC- 2185M:500M
    LATITUDE-    N 41 46 40        PRECISION-   100M
    LONGITUDE- W 114 49 52  REFERENCE POINT- MAIN ENT
    UTM:  ZONE 11N  NORTHING 4627163  EASTING 680255
    PUBLIC LAND SURVEY  TOWNSHIP- 045 N   RANGE- 063 E
        DESCRIPTION      SECTION- 22  SECTION SUBDIVISION- NENW
    RIVER BASIN- 79L   SALMON FALLS CREEK        DOMAIN- UNKNOWN
    STATUS- PAST PRODUCER  OPERATION TYPE- MINERAL LOC
    MESA ID NO.           YEAR FIELD CHECKED-       MAP REPOSITORY-  FOC
    MAP NAME- CONTACT              TYPE- 15 MIN
    1:250,000 MAP NAME- WELLS                  MINERAL PROPERTY FILE- 21.099
    PRIMARY NAME- MAMMOTH
    COMMOD/MOD-  COPPER                                     SILVER
                 MOLYBDENUM
    NEV BUR OF MINES, BULL. 54, 1957. P. 39, PT. 5.
    U.S.G.S. BULL. 847-A, 1935, PP. 33- 34.
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FIGURE 3-2

(Explanation Concluded)

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    U.S.G.S. BULL. 497, 1912, PP. 124 - 126, PL. 4.
    NEV BUR OF MINES RPT 2, 1962, P.11.
    MULTIPLE PROPERTY STUDY - - MPF DATA FILED UNDER 0320070159

   240
119 NAME- SIWASH                                   REFERENCE NUMBER- 0320070582
    STATE- NEVADA                      COUNTY- ELKO                           ELEV:PREC- 2158M:100M
    LATITUDE-    N 41 46 57          PRECISION-    1KM
    LONGITUDE- W 114 49 18  REFERENCE POINT- ORE BODY
    UTM:  ZONE 11N  NORTHING 4627708  EASTING 681027
    PUBLIC LAND SURVEY  TOWNSHIP- 045 N   RANGE- 063 E
        DESCRIPTION      SECTION- 15  SECTION SUBDIVISION-
    RIVER BASIN- 79L                                  DOMAIN- BLM ADMIN
    STATUS- PAST PRODUCER  OPERATION TYPE- UNKNOWN
    MESA ID NO.            YEAR FIELD CHECKED-       MAP REPOSITORY-  FOC
    MAP NAME- CONTACT              TYPE- 15 MIN
    1:250,000 MAP NAME- WELLS                     MINERAL PROPERTY FILE-
    PRIMARY NAME- SIWASH
    COMMOD/MOD-  COPPER                                         LEAD
                 SILVER                                         GOLD
    SMITH, ROSCOE M. MINERAL RESOURCES OF ELKO COUNTY, NEVADA.
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